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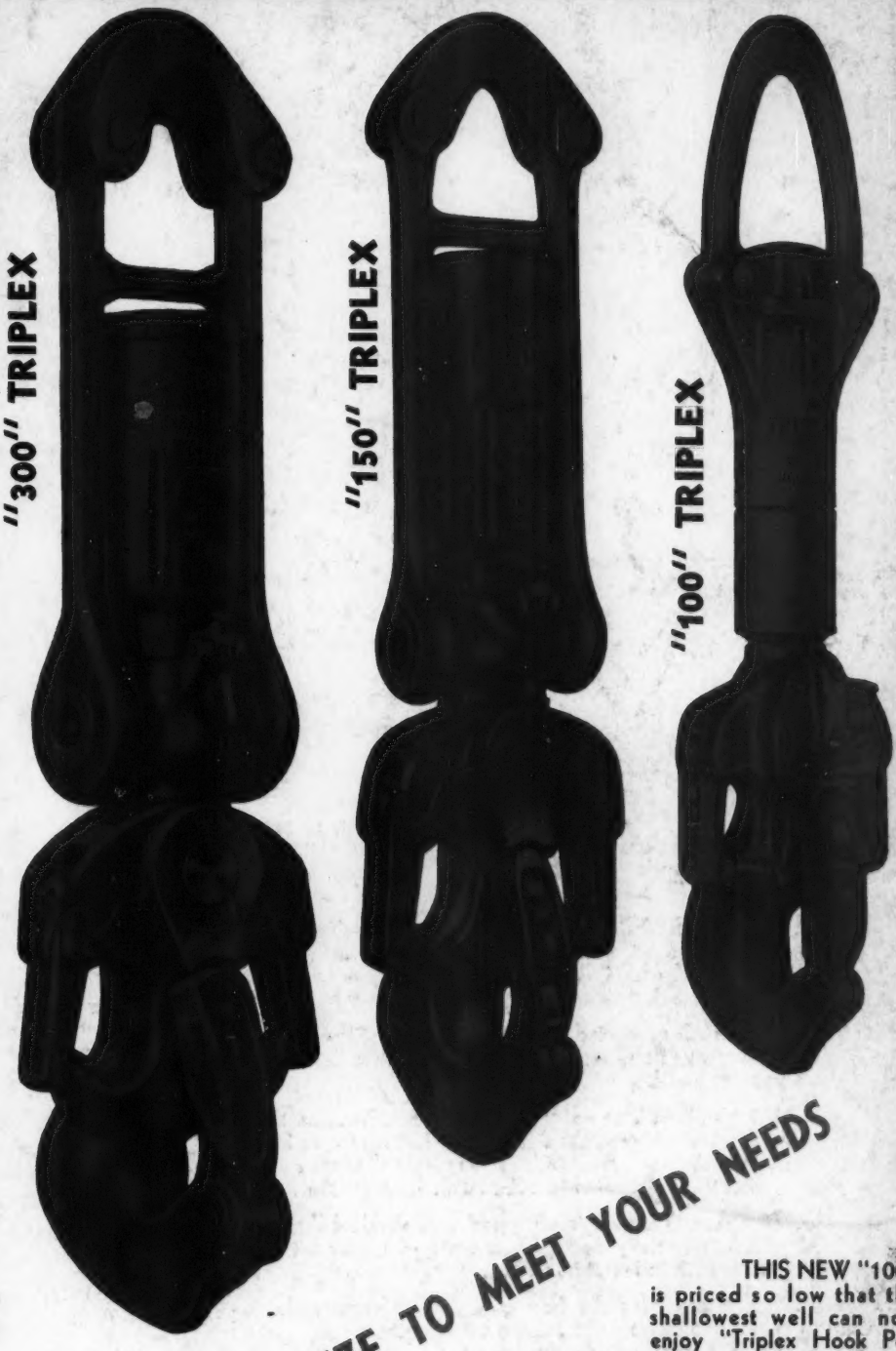

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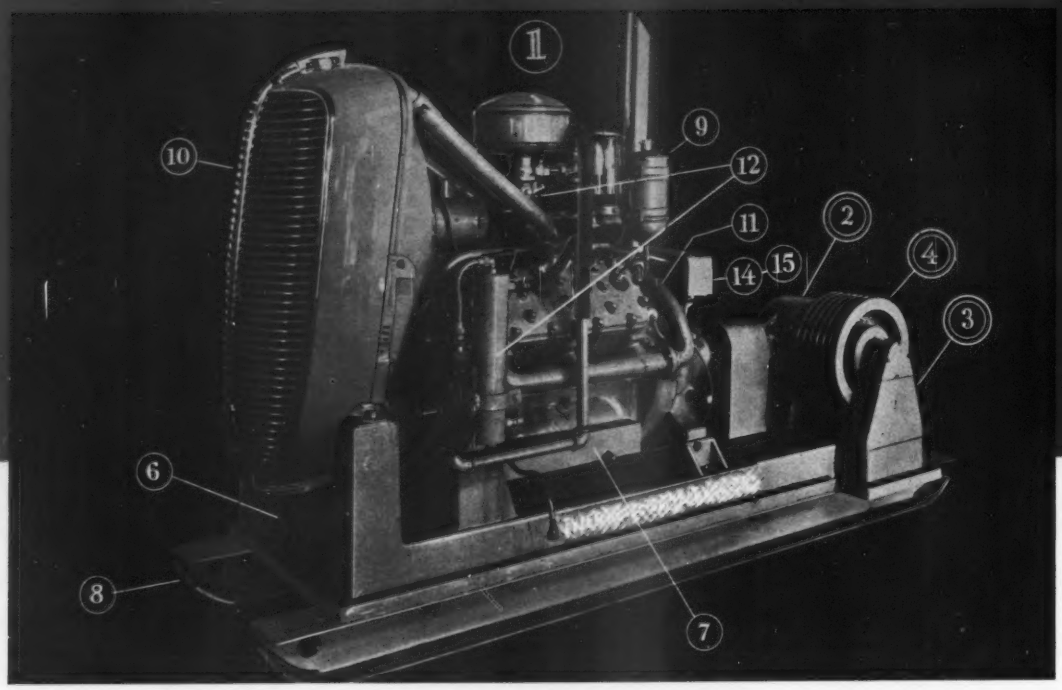

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Wilmington Drilling And Production

By C. J. Dean
Field Engineer,
General Petroleum Corporation

Wilmington oil field is located along the shore line of the Pacific Ocean in the Wilmington-Long Beach Harbor district, approximately 20 miles south of the center of Los Angeles. The structure is an anticline which is cut by several transverse faults. These faults form sharp lines of demarcation as to well productivity, oil gravities, edgewater limits, and gas-oil ratios.

The main portion of the field was discovered by the General Petroleum Corp. on Dec. 6, 1936. On Mar. 15, 1938, 15 months old the Wilmington field had a potential production of about 275,000 bbls. per day, and under curtailment was producing 128,000 bbls. per day from 390 completed wells. The cumulative production was 20,000,000 bbls. The proven portion of the field so far, is approximately three and one-half miles long and two miles wide with the south and southeastern limits as yet unproven.

Productive Zones

Fig. 1 is a diagram of the productive column showing the position, thickness, and general characteristics of the oil zones in the field at a high structural location, where the maximum thickness of the oil zone is found. This section is taken from the General Petroleum Corp.'s Ford lease, located in the central portion of the field near the Long Beach-Wilmington boundary line.

The uppermost zone is the Tar Zone which is 200 feet thick and contains about 60% oil sand. The oil is from 13° to 15° A.P.I. gravity, and carries from 2 to 2.5% sulphur. Wells in this zone may produce from 50 to 200 bbls. per day, but this rate is only an estimate because the zone is usually cased off, or is produced with the Ranger Zone.

The Ranger Zone is approximately 500 ft. thick and contains from 10 to 20% sand, the thicker sand bodies being found on the flanks of the structure. Most of the oil is produced from the central portion of the zone, the top and bottom strata are primarily shale wih thin streaks of oil sand. The sands are quite fine and unconsolidated. Sand troubles are common in wells producing from this zone. The gravity of the oil varies from 15° to 24° A.P.I. and contains from 1.2 to 2.2% sulphur. Ranger wells vary in production from 100 to 2700 bbls. per day, but the majority will have initial rates of less than 600 bbls. per day.

The Terminal Zone is the major producing zone of the field and has a thickness of approximately 1075 ft. Oil gravities, formation pressures and consolidation of the sands increase with penetration into this zone which makes it advantageous from a producing standpoint to separate the zone into Upper and Lower Terminal at about the midpoint. The Upper Terminal, 500 ft. thick, produces oil from 16° to 24° A.P.I. gravity and contains approximately 65% of fine, loosely consolidated oil sand. This portion of the zone is a source of sand trouble, particularly with the lower gravity oil. The Lower Terminal, 575 ft. thick, produces 24° to 30° A. P. I. gravity oil and contains approximately 45% of fine sand, which is slightly more consolidated than the Upper Terminal sands. Sand troubles are not so acute in this zone because of the higher gravity and firmer sands. Sulpher content of the Terminal oil varies from 0.6 to 2.5% ,being highest in the heavier oil. Full Terminal wells produce at rates from 4,000 to 8,250 bbls. per day, the latter being the maximum potential established by any well in the field to date.

The Ford Zone was discovered on the Ford Lease, where productive sands are found between the depths of 4900 to 5400 ft. On the western end of the field this interval contains wet streaks, but a small amount of production is taken from 700 to 800 ft. below the top of the zone. This zone is composed of a series of shales, tight gray sands and compact, hard oil sands, The productivity of sands in this zone is limited by comparatively low permeability. Completions in the Ford Zone range from 200 to 900 bbls. per day of 28° to 32° gravity oil. The hard, compact, oil sands are not a source of sand trouble.

The original formation pressures in these zones were approximately equiva-

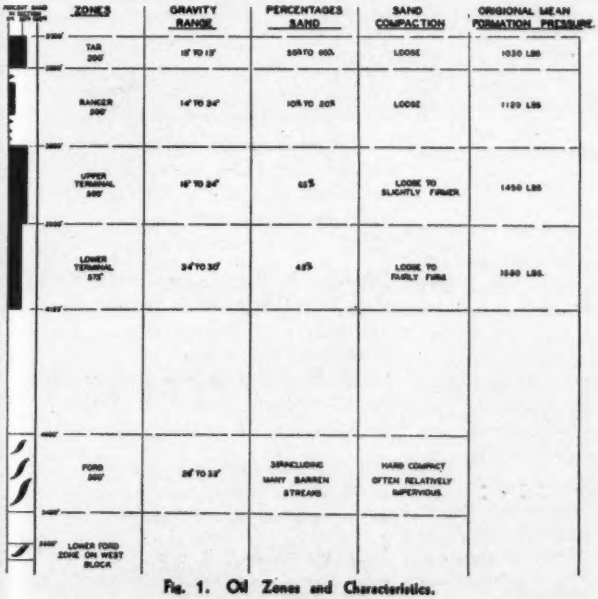

Fig. 1. Oil Zones and Characteristics.

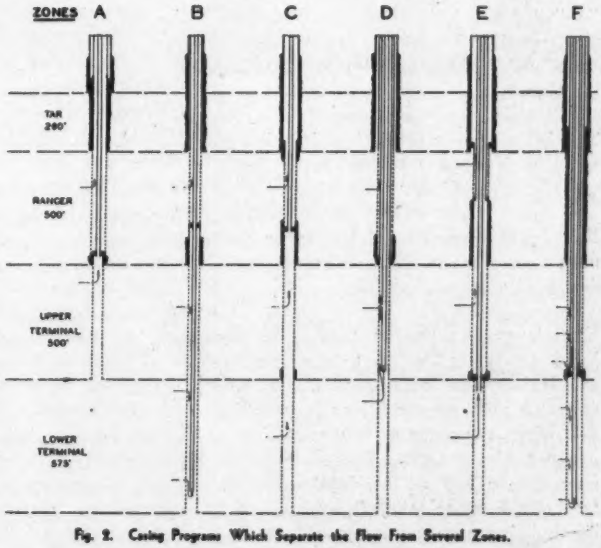

Fig. 2. Casing Programs Which Separate the Flow From Several Zones.

lent to the pressure that would be exerted by a column of salt water from sea level to the subsea level depths. These values at the midpoint of the various zones are shown in Fig. 1.

The control of sand is the major production problem of the Wilmington field. Many other fields in the State have similar problems and the same general methods of control are applied. The local factors which lead to sand trouble in this field are the variations which occur in the oil gravities and the formation pressures through the long intervals opened to production, and the loosely consolidated condition of the fine grained oil sands.

Drilling Problems

There are no difficult drilling problems in this field. The usual length of time required to drill and complete these wells is from three to five weeks. Interesting developments have occured in the practice of controlled direction drilling and in the casing programs used for separation of flow from several zones.

Directional Drilling

Controlled directional drilling is being commonly practiced in this field. It has been found necessary to bottom the holes at some distance from their surface locations for the following reasons:

First schools, channels, industrial plants, or reservations for future plants occupy the desired surface area.

Second, the development of three zones by individual wells at a common subsurface location. In this case, one well is drilled vertically and two wells are set back 150 feet at surface, and directionally drilled to a common subsurface location.

Third, the proper subsurface location of wells with respect to the many faults which cut the field.

Fourth, the necessity of keeping a well under, the sometimes very narrow, boundaries of a lease.

Experience has proven that wells can be directionally drilled to any reasonable subsurface location with accuracy and at a moderate additional cost. The following figures are averages for a group of eleven wells which were drifted from 50 to 750 ft. at depths varying from 3000 ft. to 4100 ft., the average depth being approximately 3600 ft. The drilling time for directed holes was 155 ft. per day as compared to 188 ft. per day for straight holes, or approximately four additional days would be required for a directed hole to a depth of 3600 ft. The cost of directional tools, and supervision averaged $1000 per well. Using a figure of $300 per day for rig time gives a $1200 cost for the four additional drilling days and a total additional average cost of $2200 for a directionally drilled hole to 3600 ft. These holes missed their objectives by an average of 19 ft., which is comparable to the drift of a normal straight hole. Results may be practically as accurate as the operator desires but usually a reasonable mean is attempted between absolute accuracy and the increased cost of such exact work.

C. J. Dean, of General Petroleum Corp. of California, Los Angeles, Calif., graduated in petroleum engineering by the University of California in 1923, entered the employ of General Petroleum Corp. of California where he has been successively roustabout, gauger, rotary helper in production department, petroleum engineer in geological department, and, currently, field engineer in the production department.

A characteristic of a directed hole, which is usually more important than absolute accuracy, is the straightness of its course, in both the vertical and horizontal planes. Sharp changes in course may be reamed so that casing will pass freely, but they may cause serious rod and tubing wear when the well starts pumping sandy oil. The higher the kinks occur in the hole, the more will be the weight of the rod string below the kink, and the greater will be the side-thrust load. It is good practice therefore, to start directional drilling as deep as a reasonable drift angle will permit.

Casing Programs

The practice of producing several zones simultaneous in one well has led to the development of some ingenious and complex casing programs. The practice has had the greatest application in the highly competitive Long Beach entrance channel area where surface locations are limited. At this structurally high location, the Ranger and Terminal zones form one contiguous productive section 1575 ft. thick, which is unbroken by intermediate waters. The varying characteristics of the interval have been described. The casing programs are designed to provide separation and individual control of flow rates from as many as three intervals, thus one well is made to function as three separate wells.

Fig. 2 is a diagrammatic section in the Long Beach entrance channel area showing several types of casing programs. The Tar Zone in this area is composed of interfingering oil and water sands and at present is not being produced. The primary water shut off is made at the base of the Tar Zone usually with 11¾-in. casing. The interval to be produced is then cased in two or three separate units, commonly using 8⅝-inch and 6⅝-in. casings. The location of casing, of perforated intervals, of cement jobs, and of the packers are shown on Fig. 2 and will not be restated. Arrows indicate the direction of flow.

Program A, Fig. 2, was the first developed to produce two zones separately and was used in the central portion of the field which explains the location of the primary shut off at the top of the Tar Zone. The Ranger Zone flows between the 8⅝-in. casing and the tubing, and the Terminal Zone through the tubing which is packed off between the zones. The holes in the 8⅝-in. casing just above the top of cement provide a passageway through which the interval above may be flushed out.

Program B, Fig. 2 provides for the flow from the Ranger Zone between the casing and the tubing, and from the full Terminal Zone through the tubing. The hanging of tubing near the bottom of the Terminal Zone will prevent the accumulation of sand due to settling.

Program C, Fig. 2 is very similar to Program B, except that tubing is hung at the top of the Terminal Zone.

Program D, Fig. 2, is the first to provide three separate outlets for flow.

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The perforated casing is a combination 6⅝ and 8⅝-in. string with a 6⅝-in. flow string set in a packer at the swage. The Ranger Zone flows between the 8⅝ and the 6⅝-in. casings; the Upper Terminal between the 6⅝-in. and the tubing; and, the Lower Terminal through the tubing which is hung at the middle of the Terminal Zone. The separation of the Terminal Zone is not positive and directions of flow will vary with pressures.

Program E, Fig. 2, is different from Program D only in that the Upper and Lower Terminal Zones are separated with cement behind the casing and the tubing is packed off at the same point. This provides positive separation of the three intervals, and the christmas tree with six flow lines permits the taking of the maximum sand free rates of production from each zone.

Program F, Fig. 2, has a 5-in.-flow string hung at the middle of the Terminal Zone on a packer with twelve one-inch holes just above the packer. The tubing is run to within 50 feet of bottom and is packed off on a metal seat opposite the packer on the flow string. The ranger in this well was cemented off. The Upper Terminal flows from the bottom between the flow string and the tubing, and the Lower Terminal from bottom through the tubing.

Production Problems

The major problems of production in the Wilmington field have their source in the sand which is produced with the oil. The tendency to produce sand has influenced the rates of production, the choice of producing intervals, the size of perforations, the practice of gravel packing, and has shortened the normal life of the oil strings, rods, and tubing.

Sand is not a fluid and does not flow into the hole but must be transported by some carrying medium such as oil or gas. If sand is not withheld by some barrier such as slots or gravel pack, then the amount of sand entering the well depends on the consolidation of the sand the viscosity of the oil, and the velocity of flow into the casing. The latter factor is the only one which may be controlled. A production rate may be found for a well at which only small amounts of sand will be produced. This rate may vary from several thousand to less than one hundred barrels per day. The sand free production rate for any well will depend on the gravity of the oil, the consolidation of the sand, and the particular conditions which affect the entrance velocity rates such as the number of slots open, the gas-oil ratio, and flow by heads.

Heading Wells

The producing history of a well may

J. W. Schmid, of Republic Supply Co., Los Angeles, Calif., has been active for many years in the Institute's Division of Production work in California, and was chairman of the Committee on Arrangements for the spring meeting.

be divided into three periods, the flowing, the gas lifting and the pumping stages. The gas lift stage and the early pumping stage when high casing pressures are maintained may further be grouped as the heading period, during which, the velocity of entry is quite erratic. It is during this heading period that the control of sand is the most difficult.

Heading occurs in a well when the gas pressure in the casing exceeds the combined tubing pressure and the tubing load of oil. Gas then flows from the casing into the tubing, further decreasing the tubing load by replacing the oil with free gas, thus progressively and rapidly increasing the differential pressure between the tubing and casing, causing a violent flow from the tubing. The flow of gas from the casing results in a drop in casing pressure which means a lowering of back pressure against the formation and in increased velocity between the tubing and casing, and the ability of the formation to quickly respond to a lowering of back pressure and produce more oil to build up the tubing load, thus balancing the casing pressure. The ability of the formation to respond lessens as the formation pressures are depleted and as free gas lightens the oil, which explains the tendency of wells to flow by violent heads in the later stages of their flowing life. Pressure measurements in one well during a head showed that the reduction in back pressure against the formation is approximately equal to the drop in casing pressure. Since the velocity with which oil enters the perforations is a function of the differential pressure between the formation and the bore of the well, it may readily be seen that a maximum velocity of flow occurs during a head. This increase in velocity may be sufficient to move sand into the hole.

The following methods have been used in this field to reduce flow by heads to a magnitude which will not move sand:

First, the use of a smaller bean.

Second, flowing the well from the casing to reduce the surge chamber.

Third the use of a packer on the tubing to eliminate the surge chamber.

Fourth, the bleeding of casing to a pressure insufficient to blow around the tubing.

Fifth, the use of gas lift to stabilize the flow in the tubing.

Sixth, the use of a spring actuated valve or bean to close at a set minimum tubing pressure.

If heading flow cannot be satisfactorily controlled, it is good practice to put the well on the pump.

Pumping Practices

The pumping practices of this field do not differ materially from those of many other fields and will not be discussed except for a word about production rates. Experience with wells in the heavier areas of the Ranger and Terminal Zone production has shown that the amount of fluid which may be taken from any well without bringing in sand is in the range of 100 to 200 bbls. per day. High fluid levels which show but little draw down indicate a much greater production rate is available, but attempts to produce at higher rates have resulted in excessive sand trouble. Maintenance costs are materially greater for wells which produce sand because frequent cleaning out is necessary, as sand causes rapid wear of pumps, rods and tubing.

Rod and Tubing Wear

It is a common thought when rods are badly worn that the hole must be

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crooked. This is not necessarily true, since in many fields crooked holes do not cause rod wear and straight holes pumping sandy oil do show excessive wear. The answer is that pressure between rods and tubing in sand free oil does not cause serious metal erosion. A comparison may be drawn with the gears in a machine, with proper lubrication very little wear takes place, but the wear would be very rapid under the same load if a handful of sand were added to the lubricant.

The first instance of coupling wear which came to my attention was in a directionally drilled hole. After pumping for one month, the rods were pulled and 22 couplings had to be changed due to sand cutting. The kinks in this hole were moderate and the question of the permissible magnitude of kinks at which rod wear would not take place became of grave concern. Soon after this, a well with a fairly high sand cut which had been pumping from a depth of 2100 ft. for two and a half months, was pulled and practically all of the couplings and many of the rods had to be replaced. Many of the couplings were worn to a point below the base of the threads on the rod pin. This well had not been directionally drilled but did have a 2¾-degree kink at a point where a fish had been sidetracked. Since that time this well has been pulled approximately every 21 days to replace, as a rule, from 20 to 40 couplings, and after seven months pumping the first hole appeared in the tubing. Over a period of nine months the total replacements in this well have been approximately 250 couplings, 90 rods and one joint of tubing. The well just described is exceptional, but excessive rod wear is becoming quite common throughout the field in both straight and directed holes. For wells that make sand, it is not unusual to change from 10 to 40 couplings after pumping for a period of from 30 to 60 days. Kinks in the hole increase rod wear, but with some directed holes showing but slight wear and some straight holes showing rapid wear, it is evident that sand is a more important factor than moderate kinks in rod wear.

It has been found from experience in this field that excessive wear occurs commonly at three locations in the rod string, namely at kinks, and at the top and bottom of rod string. Wear at kinks needs no explanation. Wear in the lower part of the string may be caused by buckling the rods on the down stroke, or by the presence of more sand in the fluid due to settling. Wear in the upper part of the string may be due to the greater rod load at this location, or possibly to a concentration of sand in the frothy fluid near the top of the column.

Wendell M. Jones, of Petroleum Equipment Co., Los Angeles, Calif., graduated in engineering by the University of California in 1916, spent the next three years in the U. S. Reclamation Service and the U. S. Army. From 1919 to 1928 he held the positions of roughneck engineer, field engineer, chief engineer of production department, and assistant general superintendent with Ventura Consolidated Oil Fields, California Petroleum Corp., and The Texas Co. Mr. Jones was chairman of the Program Committee for the spring meeting.

Fig. 3 is a photograph illustrating the coupling wear that is experienced in this field. Coupling No. 1 was taken from a straight hole after four months service at a depth of 1800 feet. The lower thirty-eight couplings were changed at the time this coupling was pulled. Coupling No. 2 was in service for two and one-half months in the well described as the exceptional case. Coupling No. 3 was in service for 21 days in the same well with a rod rotator. A comparison of this coupling and Coupling No. 4, which is a new coupling, will show the amount of metal that has been removed. Coupling No. 5 is again from the same well and had 21 days service. This is a hard rubber coated coupling and the wear was the same as plain hard couplings. Coupling No. 6 has a jacket of fairly soft synthetic rubber. This coupling has had 50 days of service in a section of a rod string in which the adjacent metal couplings required changing. The synthetic compound showed very little wear and did not swell or loosen on the coupling. There was no evidence that sand had been embedded in the covering, which would cause rapid tubing wear.

Fig. No. 4, is the section of tubing which was worn through after seven months' service. The tubing was split with a torch and the two halves are shown. The section on the left may be seen, from the width of the groove, to show only rod wear except at the top, while the wide groove in the section on the right shows only coupling wear. It is apparent that the tubing was rotated 180 degrees at some time during the seven months. The hole in the tubing may be seen near the middle of the section on right. Close examination of the width of the groove will show the spacing of the couplings accomplished by placing subs immediately above the pump. The hole in the tubing occurred where two of these spacings overlapped. The actual time required to wear through the tubing was less than the seven months it was in service, and may have been as short as 42 days, since this well was being pulled approximately every 21 days.

The illustration shows that the life of tubing may be prolonged by systematically moving the couplings to a new location in the tubing each time the well is pulled. A sub rod, slightly longer than the stroke of the pump, if placed on the bottom of the rod string will space all of the couplings in an unworn position in the tubing. Turning the tubing will also give a new wearing position for the couplings and the rods.

Rod rotators will prolong the life of couplings but do not decrease the wear on tubing. The synthetic rubber coated couplings resisted wear on the first test. If this test is indicative, their use at an additional cost of one dollar per coupling will be justified.

Perforated Casing

In the field where sand is a major problef the first thought to many in combatting sand trouble is the selection of a proper slot size to exclude sand. Bridging tests on Ranger and Terminal Zone sands have indicated the majority of these sand bodies require from 30 to 50 mesh slots, but in the same well will be streaks which need as small as 20 mesh, or will stand as large as from 60 to 80 mesh slots.

The general practice has been to use from 50 to 60 mesh slots with 80 mesh being commonly used in the lower gravity areas. A few wells have been completed with 30 mesh slots. It is extremely difficult to determine the effectiveness of slots from production

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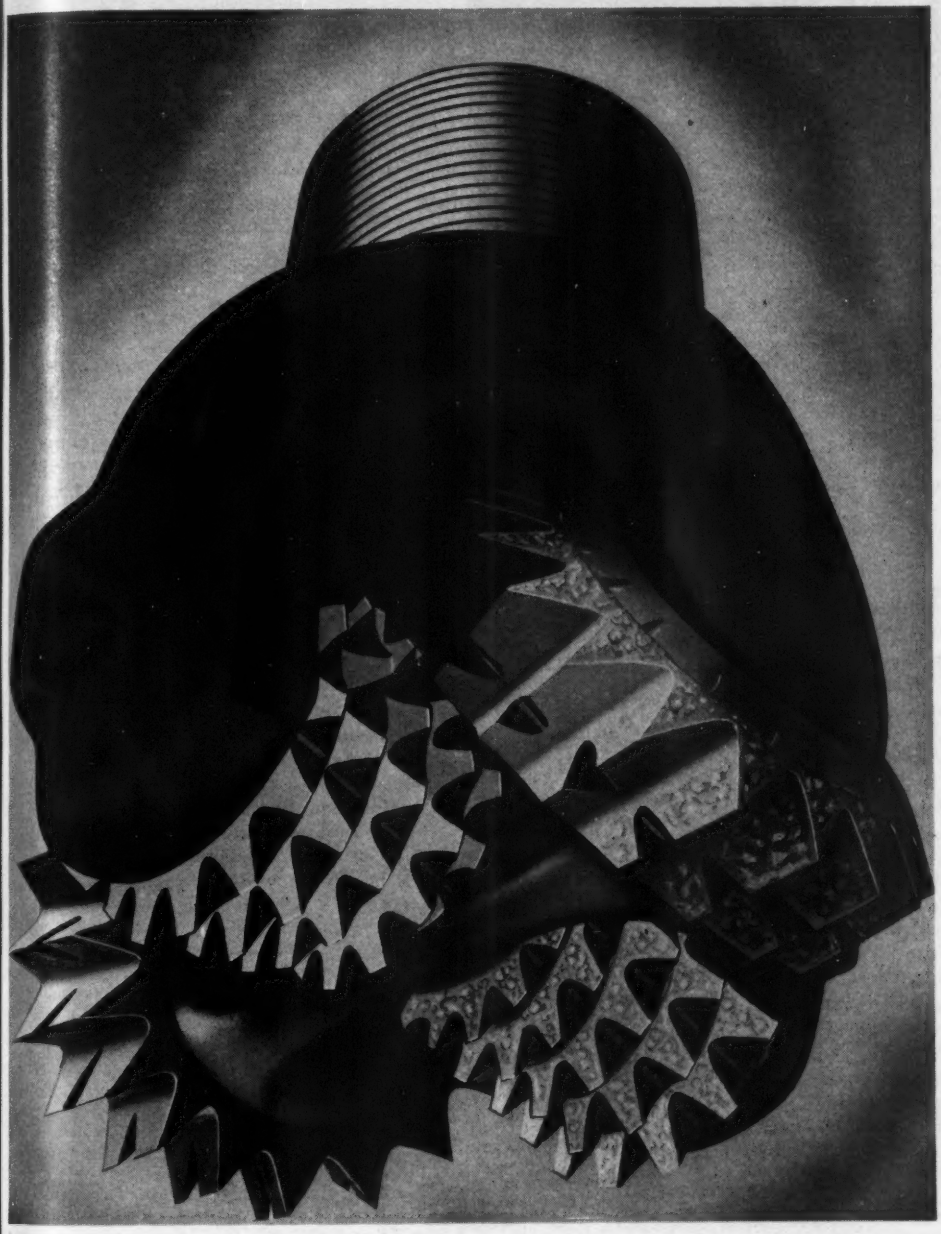

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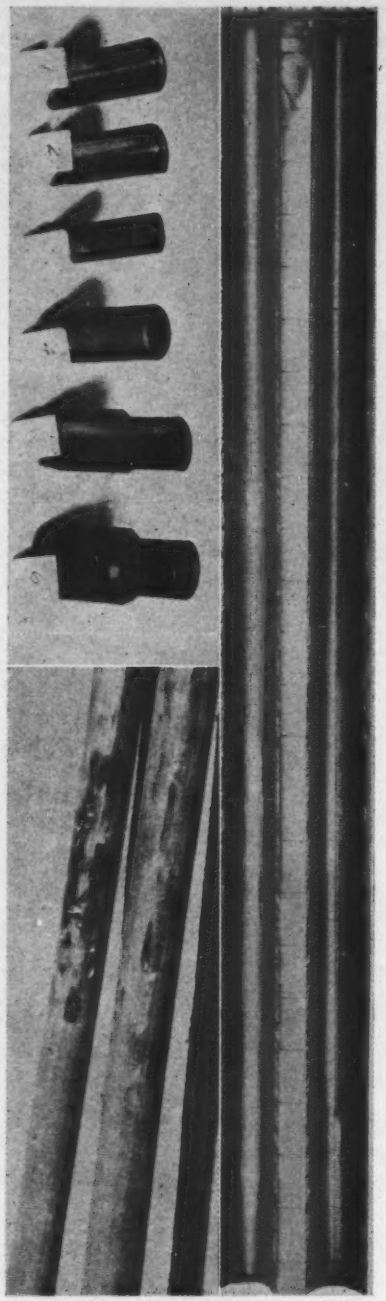
records since there are so many variables such as completion practices, production rates, enlargement of slots, and sand conditions. Available records indicate that there is little to choose between 50 and 60 mesh slots from production records up to this time. In the Long Beach entrance channel area, wells with 80 mesh slots have produced no more and no larger grained sand than wells with 50 mesh slots at comparable production rates. The use of 80 mesh slots in areas of lower gravity oil apparently increases the productivity of the wells with no unusual amount of sand being produced. Some operators use 1/8 to 3/16-in. round holes with sand cuts no higher than offset wells using smaller slots. Production practices and not perforations control sand production when slot sizes exceed all limits of bridging. The use of 30 mesh perforations which theoretically should hold back practically all of the sand have not been used on the larger flowing wells. The wells selected for test were in areas of low productivity and there was little difference in the behavior of the wells using 30, 50, and 60 mesh slots. The 30 mesh slots had a tendency to become plugged and one well produced a considerable percentage of sand grains, which should have been held on 30 mesh, indicating that some of the slots were sand cut. It is the writer's opinion that if it were possible to know the actual condition of the perforated liners even a few hours after the wells are completed that the original slot sizes would within reasonable limits be of less importance. On the rare occasions that it has been possible to see slots which have been in service, it was found that many of the slots were plugged with mud while others were enlarged, sometimes to as much as three-quarters of an inch in diameter. Excessive production rates which bring in sand and the plugging of perforations so that the oil must enter through a few slots at high velocities will soon cut out the slots and make the original mesh size meaningless. A solution of the sand problem has not been found in mesh size since all slots used have permitted some sand to enter and are therefore subject to enlargement.

Gravel Packing

The gravel packing of perforated casing to exclude sand is being tried in this field with very encouraging results.

The primary objectives of gravel packing are as follows: first, to prevent the entry of sand into the casing; second, to support the walls of the hole from the outset and prevent sloughing; third, to form a large, very permiable reservoir around the casing into which the oil may flow through an almost infinite number of openings, and from which flow will continue into the perforated casing with a minimum of resistance.



Lower left, sand cut tubing point of casing failure; top left, coupling wear; right, tubing wear.

The general practice has been to place from four to six inches of gravel around a liner having the normal size of slots. A gravel which will pass through a 3/8-in. screen and be held on a ¼-in. screen has been used in the majority of the wells packed. Gravel of this size was an aid in reducing the amount of sand produced, but still permitted the finer sand to come into the hole. One well packed with 1/8-in. by 1/10-in gravel has been on production for three weeks and has produced no sand.

Gravel packing of liners gives a promise of being of definite assistance in the solution of the sand problem. Intervals up to 700 ft. have been packed with gravel and the packing of longer sections seems practical. Present knowledge indicates that a gravel size of less than ¼ inch by ⅛-in. size should be used.

Collapsed Casing

The failure of casing in becoming a frequest occurrence in the areas of lower gravity production, which are roughly, from the vicinity of Anaheim Road northward and west of the Wilmington Fault which cuts the General Petroleum Corporation's discovery well, Terminal No. 1, and crosses Anaheim Road at about Flint Avenue. There were approximately 250 wells drilled during the first year in the areas described and to date, there are a total of 38 known cases of bad oil strings in this group. This record is not complete and does not include many wells from which crooked tubing has been pulled after washing. It is reasonable to believe that this figure may be doubled when all of the wells are entered. An assumption of 50 failures would be conservative and this would mean that one well out of five has experienced bad pipe in less than one year after completion since the average age of the wells is from six to nine months.

A break in the perforated casing is commonly indicated by the appearance of large shale fragments and a sharp increase in the sand cut, usually plugging the beans and often the tubing. The actual location of bad pipe in many of the cases cited above is still unknown as the well continues to flow, commonly through the casing, with tubing plugged with shale. Approximately one-half of the oil strings on which information is available have gone bad from 25 to 75 feet below the top of the perforations. The balance are scattered and so far show no definite correlation.

The reasons for perforated casing failure must be generally attributed to the production of sand, the exceptions being movement along a fault plane or the squeezing action of a shale body as it is

hydrated. Naturally in a field cut by as many faults as Wilmington, the shearing of pipe along a fault plane might be suspected, but no evidence of failure due to this cause has been found. The failure of casing due to the production of sand may occur in several ways. A cavity may be formed under a shale body which finally collapses and shears off the pipe. The casing may be gradually bent out of line by minor sloughing and the differential loading of sand and shale around it until it pulls in two, usually at a joint. Another contributing effect of producing sand may be the cutting of the casing by sand in the oil as it flows through the perforations. It has been the usual practice to hang tubing at the top of the perforations and the resulting greater flow from the top of the zone may be the reason why so many failures have occurred at this part of the hole. Sand cutting of perforated casing may occur at any point in the hole if only a few perforations have opened up, forcing the production through a small number of slots with an abnormally high velocity.

Fig. 5, shows tubing which has been badly cut by sand at a point of casing collapse and gives a clear insight into what has happened in this particular well. The tubing was hung 18 ft. below the top of the perforations. The pits cut in the lower piece were opposite the actual top of the perforations. Close examination of the pits in the tubing will show the exact pattern of the slots in the 8⅝-in perforated casing, which was 50 mesh, 2-in. slots, 6 inch centers, with 16 staggered rows. There are three prominent pits in a line 6 inches apart and the staggered rows on either side may be seen at the midpoints between these three prominent pits. The upper section of tubing shows faint indications of slots, but generally the sand blasting was diffused with four holes being cut completely through the tubing. This cutting occurred eight feet above the original tubing depth, clearly indicating that the pipe was bad at the point of the diffused sand blasting of the tubing.

Conclusions

Experience in the Wilmington Field has indicated that fundamentally the control of sand production lies in the regulation of the velocity of fluid entry into the casing.

The resuls of gravel packing to date, give promise that this process will be a major factor in the solution of the sand problem.

Presented at the
Spring Meeting of the Pacific Coast District
A. P. I. Division of Production
Los Angeles, California

Warns Producers

Failure of producers and marketers to understand each other's problems lies at the bottom of the petroleum industry's "feast or famine" history, believes R. K. Davies, vice president and director of

R. K. Davies

Standard Oil Co. of California. Speaking before the Spring Meeting of the Pacific Coast production division of the American Petroleum Institute, recently, Mr. Davies summed his views thus:

"As the passing years make it ever clearer that a limited market outlet, rather than a limited productive capacity, confronts the industry, it becomes equally clear that producers must obtain a better understanding of the marketing process. And by the same token, were I talking with a group of marketers, I would assert with equal conviction the necessity of their better understanding the nature of producing operations. It is no longer possible for either group to attempt to isolate itself from the other without entailing disastrous consequences for both. The actions of both producers and marketers affect the market, and through the market react upon both. An unintelligent handling of the production situation must ultimately destroy the product markets, and hence values for crude; stupid treatment of the marketing situation must have the same final result. Only balance and order in both branches can produce fair return."

Steps to protect the Los Angeles harbor district from fire hazards due to oil drilling and storage were covered in a report of a special committee filed with the Harbor Commission.

Tide Water Associated Honors Veteran Workers

Veteran employees of the Tide Water Associated Oil Co., Associated division, were recently honored by the company, when William F. Humphrey, president, made the presentation of service emblems at the San Francisco company headquarters.

With four men attaining the enviable thirty-five years service mark this year, the total in this classification now numbers seven. They are W. A. Sloan, regional treasurer, E. Whitehead, fuel oil sales manager, Miss L. D. Bingley, secretary to Mr. Whitehead, each of whom reached the thirty-five year goal last year, and J. A. Jones, assistant vice president, G. D. Zeh, manager of the marine department, W. S. Badger, tax department and Carl Bronson, sales agent at San Jose.

Mr. Humphry also made emblem presentation of five in the twenty-five year, three in the twenty year, and one in the fifteen year and three in the ten year classifications.

Two thousand and sixty-seven, or 47% of the Associated employees have service records of ten years or more.

A.I.M.E. Members Hear Prof. Dodge

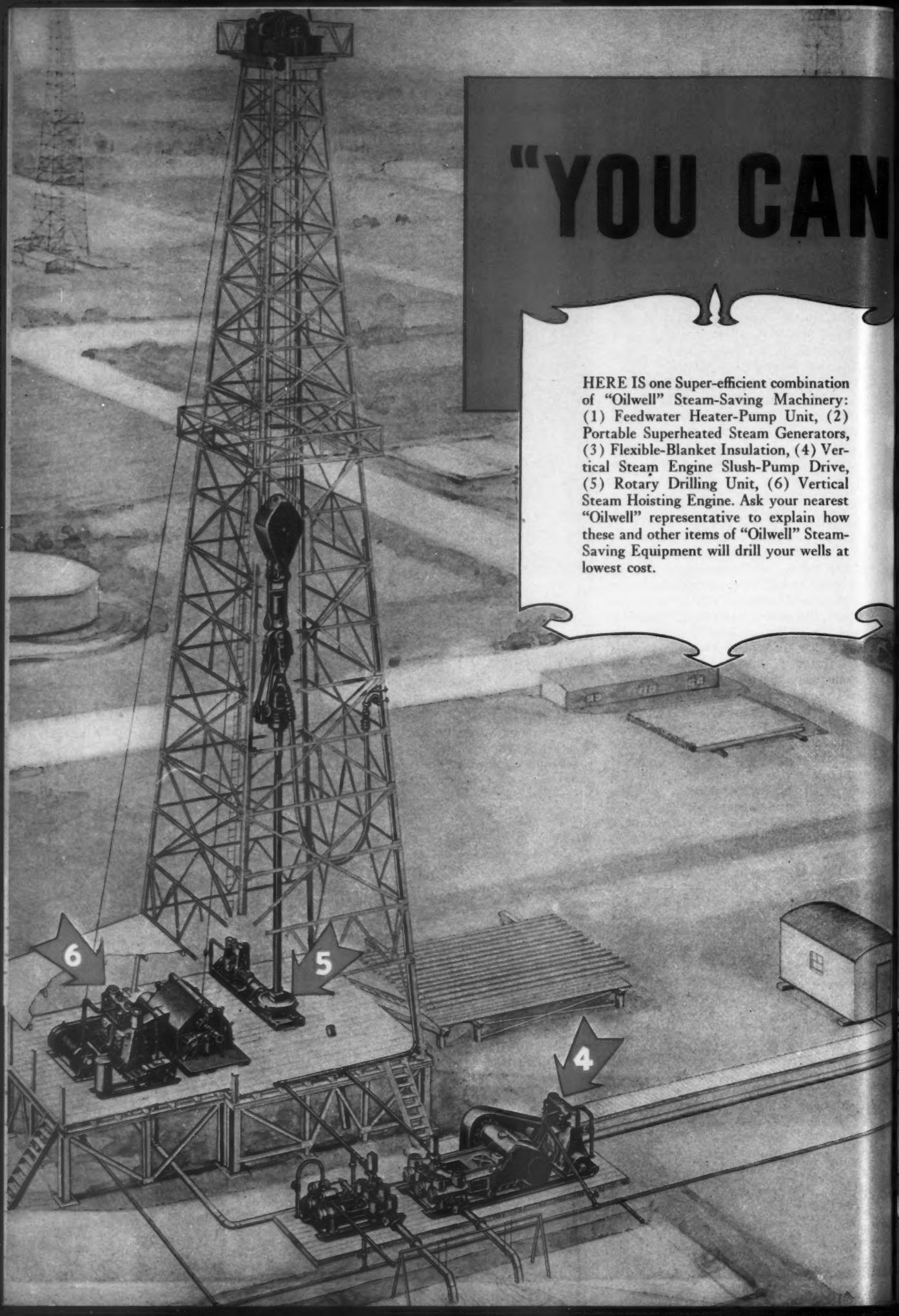
Members of the Southern California section, American Institute of Mining and Metallurgical Engineers, held their April dinner meeting at the Los Angeles Athletic Club in Los Angeles April 28.

The speaker of the evening was John W. Dodge, professor of petroleum engineering, University of Southern California, who recently returned from a trip around the world on which he surveyed oil production in many sections of the the globe. While his topic was "Some Glimpses of the Oil Fields of the East Indies", he discussed many other highlights of petroleum production abroad.

Cliff Reese Purchases Bit and Welding Plant

C. L. "Cliff" Reese, former sales manager of the Globe Oil Tools Co., has just purchased an interest in the Dunlap Welding and Bit Works of Bakersfield and Avenal.

Cliff Reese advises that although the present line is limited to drag type drilling bits and general field welding that it is the intention of R. J. "Fat" Dunlap and himself to add other items in the near future.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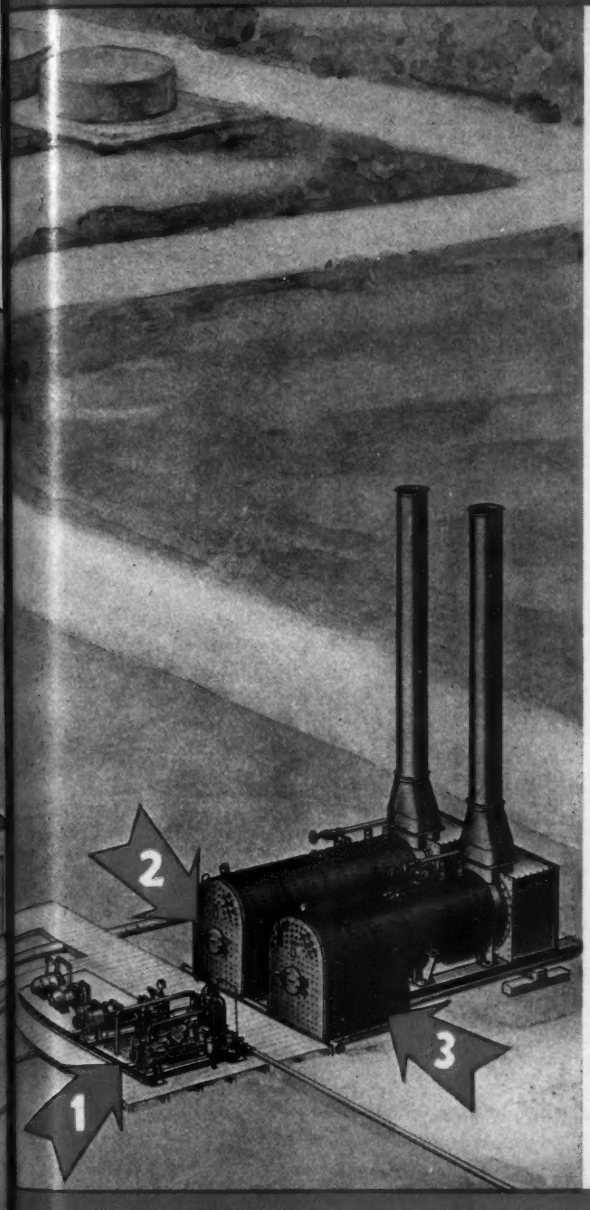

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SAVES ON DEPRECIATION

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"OILWELL"

Recent Pressure Drilling At Dominguez

By S. Grinsfelder and Jan Law
Union Oil Co. of California

It is generally agreed among those who are concerned with the completion of wells that if, during the drilling in period, the interval to be produced is subjected to less pressure than the formation pressure, the well will be more productive, than if the walls were mudded off or a pressure is imposed greater than the formation pressure.

This conclusion is based on the following opinion. First, the use of mud as circulating fluid produces harmful effects, and secondly, the use of oil or water as drilling fluids produces harmful effects but especially if the hydrostatic head is greater than the formation pressure. Furthermore, in many instances where cable tools or modified cable tool methods have been used, harmful effects have resulted by sealing off oil sands where these sands have been interbedded with shales.

With these thoughts in mind, four wells were completed in the latter part of 1937 in the Dominguez Field by the Union Oil Co. of California using oil and gas as circulating fluids and attempting to effect a drilling in pressure less than the formation pressure.

These completions were made in the First and Second Callender Zones in the middle Pliocene and in the Seventh Zone in the Upper Miocene.

The First and Second Callender Zones had been subjected to considerable depletion as they had been produced almost continuously since their discovery in 1924. Their original formation pressures had declined from 1,700 pounds per sq. in., which is equivalent to the hydrostatic head from the surface to 700 pounds per sq. in., the currently measured bottom-hole pressure at the locations in question.

The Seventh Zone, which has been produced since 1934, had declined in bottom hole pressure from an estimated 2,500 to 1,500 pounds per sq. in.

The thickness of the intervals drilled varied from 159 to 489 ft. and were interbedded sands and shales of varying degrees of hardness and texture and average 62% sand. Individual sand strata varied in thickness from a few inches to 80 ft.

The interval for these completions was pre-determined by offset requirements. For this reason no particular effort was made to evaluate the relative productivity of zones within these intervals. Only two formation tests were made and these were taken while drilling the first well.

S. Grinsfelder

Graduated from the School of Mines, University of California, in 1920, and for the next two years was engaged as a mining engineer by the Shasta Zinc & Copper Co., Winthrop, Calif. In 1922 he was employed by Union Oil Co. of California, and for twelve years was occupied in various capacities—geologist, engineer, and finally assistant manager—in the Rocky Mountain and Texas Divisions. He was transferred to Los Angeles in 1934 as development engineer in the field department, and is now district engineer in the Dominguez area.

Mechanical Equipment

The mechanical equipment involved in a pressure completion differs from ordinary drilling practice only in that facilities must be provided to handle oil and gas under pressure. These facilities must provide a means for (1) introducing oil and compressed gas into the drill pipe, (2) a packoff arrangement between the drill pipe and casing, and (3) a means of separating oil and gas and drilled cuttings prior to the re-introduction of oil and gas into the system.

The equipment used at Dominguez is illustrated in the "typical flow diagram" (Fig. 1), in which only the essential features are shown. The equipment is similar to that used in the Fitts Pool by the E. H. Moore Co.[1], and has been described previously.

For the completions under discussion, the following is a list of the principal equipment:

1. Mud Pump 14"x7¼"x14" with 5" liners.
2. Mixing chamber for high pressure gas and oil.
3. Hydril rotary table and tandem packers for 8⅝" casing.
4. A system of adjustable flow beams.
5. Flow line sampler for cuttings.
6. Gas Separator.
7. Conical settling tank.
8. Mud pit.
9. Storage tank.

Meters for measuring gas and oil rates and gauges for measuring pump and line pressures were also installed. The piping used at Dominguez for a pressure completion and the lease pipe lines serving the well are shown in Fig. 2.

Comparative Results

The following tabulation gives a comparison of these completions with previous nearby mud completions: (Refer to Fig. 3).

Wells "B" and "D" were sub-pressure completions in the Seventh Callender Zone at a depth of approximately 6,700 ft. These wells showed no marked increase in oil production over their neighboring mud completions, wells "A" and "C". The pressure completions, however, do show an increase in gas production. This increase cannot be assigned to the nature of the completion as gas sands were permitted to produce in the sub-pressure completions which were cased off in the mud completions.

The time of completion was the same in wells "A" and "B". The time of completion is taken as the time from testing the water shut-off, to the time that the drilling crew moves off the well, which is equivalent to its acceptance by the Production department. Well "B" encountered a fishing job which accounts for its additional time of completion over well "C".

It must be said that from their locations Group I and Group II afforded a favorable comparison. The sub-pressure completed well in each group was made as

1. K. R. Teis, "Pressure Completion of Wells in the Fitts Pool", **Drilling and Production Practice**, 1936, 23-31, American Petroleum Institute, New York (1937).

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Axelson can't control well conditions, but can—and does—meet them by the most precise control of every mill and factory operation from pig iron to finished product. No condition is too small to receive Axelson's consideration in the making of Sucker Rods that will, most efficiently, stand the whip and stress of faster, longer strokes and heavier loads . . . Operators all over the world are pumping oil with Axelson Sucker Rods at the lowest cost for equipment and the least loss from "down" time.

1. Bar storage and Medart bar straightening machine. Ample stocks are always carried at St. Louis and Los Angeles to guard against transportation delays.

2. Feeding bar into Medart straightener.

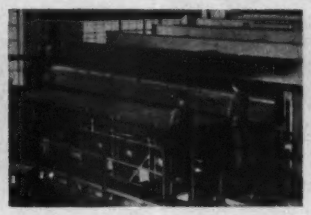
3. Discharging bar from Medart straightener and inspection for accuracy.

4. Heating and forging ends of Sucker Rod Bars.

5. Close-up of three-stage forging operation.

6. Automatic temperature controls for heat treating furnace.

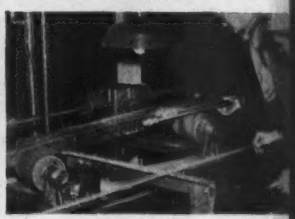
7. Rechecking alignment of forged end with axis of bar.



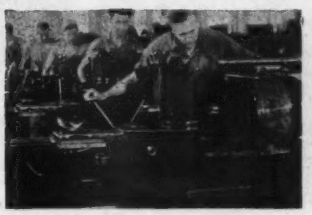
8. Feeding end of heat treating furnace.

9. Discharge end of heat treating furnace 32 feet wide and 36 feet long.

10. Axelson continuous type shot blast cleaning machine.



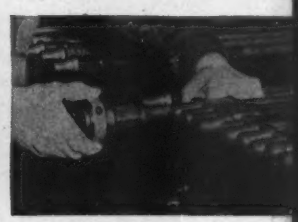
11. Discharge end of shot blast cleaning machine and inspection for defects.



12. Machining and threading Sucker Rod pin ends.

13. Close-up of machining Axelson Sucker Rod pin ends.

14. Gaging threaded pin after machining.



15. Checking form, lead and pitch diameter of thread with "GO" gage.

16. Checking pitch diameter with "NO-GO" gage.

17. Checking relationship of tapered bottom partial threads to base of shoulder.

18. Proper assembly of couplings to prevent reversal of stress in pumping.

19. Careful handling and loading of finished rods in cars.

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a twin location to a mud completion in the same zone. The mud completion in each instance has been abandoned in this zone and has since been carried to a deeper zone.

Although the results of the pressure completions of wells "B" and "D" cannot claim any benefit over their twin mud completions, it may be said that well "B" which was the first completion attempted required considerable adjustments in equipment and procedure during its operation and that well "D" encountered a fishing job which made it necessary to kill the well with water and dead oil.

The data from sub-pressure completions "B" and "D" indicated that these wells were producing only from 10% to 20% of the time during which pentration was being taken. This is in contrast to the performance of the two shallower wells "J" and "G", completed respectively in the First Callender Zone at a depth of 4,220 ft., and in the Second Callender Zone at 4,350 ft.

Greater benefits are apparent in the completion of the shallower wells in Groups III and IV. Well "G" sub-pressure completed almost two years subsequent to wells "E" and "F" took the same time and had a greater initial production than the average of wells "E" and "F" which are neighboring mud completions in the same zone. The initial production (average of first 10 days production) for well "G" is inadequate for comparative purposes as a production test with a pressure recorder indicated that this well initially had an absolute potential of approximately 1,100 bbls. per day.

The initial production of approximately 600 bbls. per day was more than what was anticipated from the sub-pressure completion of well "J". No wells had been completed in this zone for approximately 10 years. An initial production of from 300 to 350 bbls. per day would have been very satisfactory. Well "J" required 9 2/3 crew days for its completion as compared to 27 and 18 crew days respectively for wells "H" and "I",

Jan Law

Also graduated from the School of Mines, University of California, with bachelor's degree in Petroleum Engineering, class of 1933, and in the same year was employed by Union Oil Co. of California. He has been active since in various phases of field department work, and has spent some time in the Los Angeles office as apprentice engineer. He is now assistant engineer in the same department in the Dominguez district.

drilled with mud. The crew day comparison for this group is not fair due to the improvement in drilling technique over the ten year period between the mud completions and the sub-pressure completion.

The comparison of these four wells which used sub-pressure drilling methods indicates that no appreciable benefits were derived from the two deep wells over their neighboring completions; however, marked increases in initial production were shown by the two shallow wells.

Field Practice in Sub-Pressure Control

The fundamental factors to be considered in sub-pressure completion technique are:

1. A circulation of oil and gas which generates a bottom hole pressure below the static pressure of the formation pentrated.

2. A coordination of the drilling rate with the lifting power of the circulation employed. This lifting power is a function of the velocity and composition of the circulating fluid mixture.

3. A circulating rate and composition which best maintains the walls of the open hole.

The recent practice at Dominguez attempted to fulfill the first of these factors by (1) an estimation of the static formation pressure to be encountered and (2) an estimation of an oil and gas mixture to be circulated which will give bottom hole pressure less than the static formation pressure.

The static formation pressure was estimated from sub-surface data compiled periodically for this field.

The estimation of a generated bottom-hole pressure involves the consideration of several factors, mainly (1) the rate of oil circulation, (2) the rate of gas circulation, (3) depth of the hole, (4) size of the effective flow channels and (5) input and output pressures.

FIG. 1

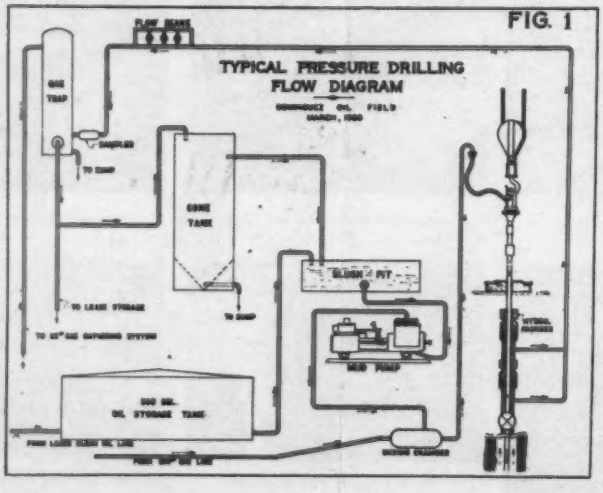
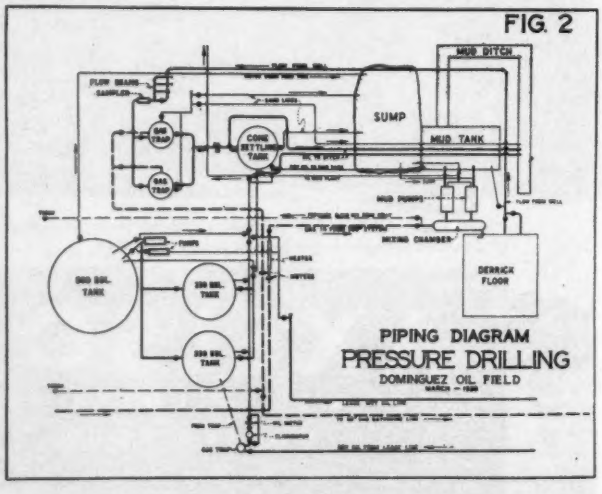


FIG. 2



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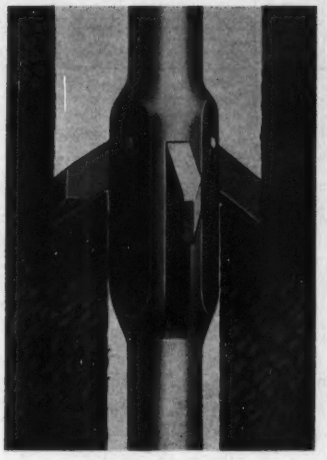
From top to bottom, the MacClatchie Scraper is an **engineered** scraper. At every point it is packed full of performance features that give smoother operation, greater safety and more full-gauged hole on every run. It is THE scraper for today's deep well operations.

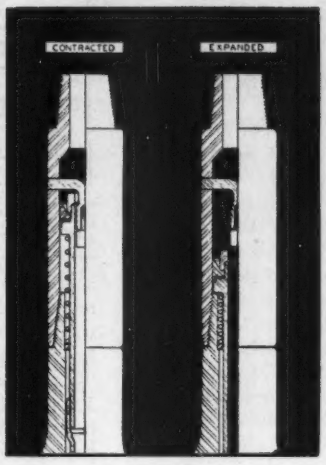
As an operator you are interested in engineering **facts,** and illustrated on the left are four of the many features that have made the MacClatchie Wall Scraper famous for outstanding dependability on **all** types of scraping jobs under **all** kinds of operating conditions.

Only in the MacClatchie Scraper do you get this type of engineering, and this is only **part** of the story. For the **full** story see your nearest MacClatchie representative. Or better yet, **try** one on your next scraping job and convince yourself!



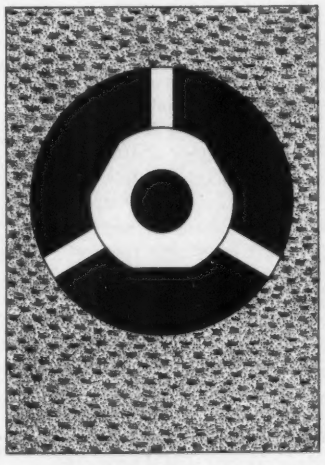
Stabilized Cutting

When fully expanded the blades cut at a slight downward angle. This forms a high-centered shoulder that holds the scraper steady and eliminates "wandering." For added stability each MacClatchie Scraper is made up with the largest possible diameter pilot bit that will pass through the casing.



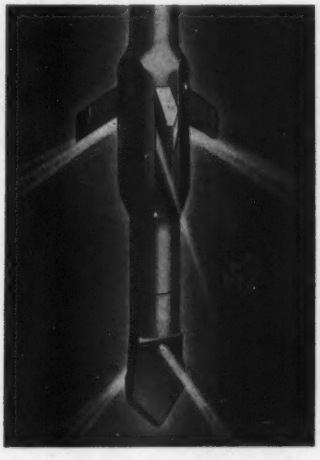
Positive Expansion—Full Circulation

With blades closed, the pump circulation is automatically throttled, giving **full** pump pressure for cutter expansion. When blades open, circulation is unrestricted. Boosts efficiency of the circulating system, reduces pump strain and gives a positive signal at rig when scraper is expanded.



Three Blade Cutting Action

MacClatchie was first with **three** bladed cutting efficiency. Because there is less load per cutter, you get more full-gauged hole per run. Three blades also mean less strain in making big cuts, and a smoother stabilized performance that's easy on your drill string.



Duo-Action Circulation

Each individual cutter blade is thoroughly washed by the circulating stream, and additional circulation is provided at the pilot bit, too! Invaluable for working through bridges and other obstructions, and a definite assurance of complete removal of cuttings at all times.

This, the Granddaddy of the MacClatchie Scraper Family, **safely** underreams up to 30" in diameter, yet will readily pass through 11¾" casing.

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FIG. 3

COMPARISON OF PRESSURE COMPLETIONS
WITH NEIGHBORING MUD COMPLETIONS IN THE SAME ZONES
— DOMINGUEZ OIL FIELD —

	GROUP I		GROUP II		GROUP III			GROUP IV		
	WELL "A"	WELL "B"	WELL "C"	WELL "D"	WELL "E"	WELL "F"	WELL "G"	WELL "H"	WELL "I"	WELL "J"
TYPE CONTROL	MUD	PRESSURE	MUD	PRESSURE	MUD	MUD	PRESSURE	MUD	MUD	PRESSURE
DATE COMPLETED	1-10-37	7-10-37	6-12-36	9-8-37	9-1-36	11-15-36	11-29-37	8-20-36	8-28-36	8-9-37
FINAL COMPLETION	7"D	7"D	7"D	7"D	7"D	7"D	7"D	7"	7"	7"
PRODUCING INTERVAL	4300-4600	4300-4600	4300-4597	4301-4700	4300-4440	4301-4475	4301-4500	3940-4200	3940-4097	3940-4200
THICKNESS-PROD. INT.	300 FT.	407 FT.	297 FT.	400 FT.	140 FT.	174 FT.	199 FT.	260 FT.	157 FT.	260 FT.
CRUDE GRAVITY-DEGREES	18 ½	18 ½	17	20	8	4 ½	9 ½	27	19	9 ½
INITIAL PRODUCTION AND TEST THEREOF	1200 bbls. 20/64"—Gas MCF	1200 bbls. 11/32"—Gas MCF	1200 bbls. 11/32"—Gas MCF	1200 bbls. 11/32"—Gas MCF	1200 bbls. 1/2"—Gas MCF	1200 bbls. 29/64"—Gas MCF	1200 bbls. 29/64"—Gas MCF	1200 bbls. 5/8"—Gas MCF	1200 bbls. 5/8"—Gas MCF	1200 bbls. 5/8"—Gas MCF
STATUS WHEN COMPL.	FLOWING	FLOWING	GAS LIFT	FLOWING	GAS LIFT	GAS LIFT	PUMP	FLOWING	FLOWING	GAS LIFT
POTENTIAL—AVE. 1938	RECOMPLETED	15 B/D	RECOMPLETED	15 B/D	110 B/D	215 B/D	200 B/D*	100 B/D	100 B/D	600 B/D

*ON TEST

MARCH - 1938

the application of the above method proved very satisfactory. With an input pressure of 175 pounds per sq. in., a gas-oil ratio of 370 cu. ft. per bbl., and an oil rate of 175 barrels per hour, it was estimated that the generated bottom-hole pressure was 600 pounds per sq. in. This gave an estimated differential of 100 pounds per sq. in. below the formation pressure. The effect of this differential may be noted on Fig. 4. A summary of Fig. 4 indicates that production from the formation was sustained for 60% of the drilling time.

In the second shallow zone well, the method of estimation of bit pressure proved less satisfactory (Fig. 5.) With an input pressure of 240 to 340 pounds per sq. in. and a gas-oil ratio of 340 cu. ft. per bbl. for a 175 bbl. per hour rate, an estimated bit pressure of 1,100 pounds per sq. in. was generated. This gave an estimated differential of 400 pounds per sq. in. above the formation pressure. The quantity of gas which was produced was greater than for the first shallow well (Figs. 4 and 5), demonstrating that the method used for estimating bit pressure does not fulfill the requirements for all operating conditions. An explanation for this discrepancy may be attributed to variations in mechanical equipment and the circulated fluid which caused greater friction losses in the second shallow well.

The lifting power of circulating fluids used in a sub-pressure completion is limited as compared with the use of mud in ordinary drilling. Cuttings may be lifted in a pressure completion by the use of high velocities and with accompanying high gas rates or lower velocities and greater quantities of oil. In the shallow completions referred to previously it has been calculated that the velocity on bottom approximates 170 ft. per minute. This is an average of 90 ft. per minute, considering that all the gas is in solution, and 250 ft. per minute, with no gas in solution, for values of 1,700-MCF per day, 615 pounds per sq. in. absolute bottom-hole pressure and with an oil rate of 175 bbls. per hour.

An example of velocities encountered for large gas-oil ratios was recently experienced in a sub-pressure completion in the Los Angeles Basin where, with an oil rate of 30 bbls. per hour, a gas rate of 1,700-MCF per day, and 215 pounds per sq. in. absolute bottom-hole pressure the velocity at the bit was calculated to be 450 ft. per minute.

In practice, the ability to make hole is usually far in excess of the facilities for lifting cuttings. At Dominguez it was found necessary to reduce drilling rates to approximately 4 ft. per hour to assure proper lifting. At times when drilling rates were greater than 4 feet per hour the failure to remove cuttings caused long clean-out periods (Fig. 4) after making connections. The coordination of drilling rates with lifting power is shown in Fig. 5. In the first shallow completion, the longer periods for cleaning out are evidence of drilling rates in excess of lifting power.

If the walls of the hole do not slough and the formations are easily drillable, it is possible to drill from 10 to 20 ft. per hour without experiencing any difficulties from the inability to remove cuttings.

The recent sub-pressure Dominguez completions indicate that the observance of the following practices will tend to maintain the walls of the hole. Uniform drilling rates with the bit on bottom and uniform production rates will help to prevent sloughing.

The foregoing has outlined the method used in recent sub-pressure drilling at Dominguez. In addition to these principal features, several other operating con-

With the drilling of the two shallow zone wells, the following operating conditions were employed. The static bottom-hole pressure, from field data, was estimated to be from 650 to 700 pounds per sq. in. The oil circulation rate was maintained at 175 bbls. per hour while the gas rate ranged from 1,500-MCF to 2,000-MCF per day. This gave a gas-oil ratio of from 360 to 480 cu. ft. per barrel. The input pressure varied between 175 and 350 pounds per sq. in. The output pressure varied between 75 and 200 pounds per sq. in. The mean drilling depth of these two wells was 4,150 ft.

Although these wells did not produce the total time during the sub-pressure drilling period, they did produce gas a good portion of the time as shown in Figures 4 and 5. In these charts the rate of gas production or loss is plotted against the depth at which these readings were taken. The readings as plotted were taken at half hour intervals. The best performance of any one well is indicated in the data from well "G". During this completion oil was produced over short periods, however, the total operation by gauges showed a loss of oil of 250 bbls. It is within reason, from the performance, that the well actually made oil.

It was the opinion that if the pressure at the bit could be predetermined from a mathematical analysis of controllable factors, a pressure at the bit less than the formation could be maintained.

A method for calculating a bottom-hole pressure to be generated was derived by Mr. E. C. Babson[2]. This method, though not wholly satisfactory, as will be explained, provided an approach to the problem. The calculations take into consideration the depth, composition and input pressure of the column of fluid within the drill pipe. The equation $Ddh = dP$ is integrated in terms of $h = VdP$ from material made available by A. P. I. research problem No. 37. In this equation,

h = height of column
P = pressure
D = density
V = specific volume

These calculations do not take into consideration friction losses and slippage which may be of considerable magnitude. The application of this method, though not thoroughly satisfactory, demonstrated that it provided a working basis for estimating generated pressures at the bit.

In the first shallow zone well drilled,

[2]. Assistant Production Engineer, Union Oil Co. of California.

ditions different from those encountered in mud completions, are worthy of consideration. These are as follows:

1. Disposal of Cuttings

After the circulating fluid reaches the surface, adequate facilities must be provided to drop the cuttings out of the system before return is made to the suction of the pump. In the recent Dominquez practice a part of these cuttings were bled from the sand line of the trap, part were collected in the bottom of the conical tank, and a part were settled out in the ditch. Prior to utilizing the ditch for settling room, some cuttings were carried over into the mud box from which it was difficult to remove them.

It is estimated that the maximum amount of sand from one completion was approximately 100 bbls. This amount of sand was in excess of the volume drilled by 82 bbls.

2. Cutting Out Equipment

If the amount of sand is relatively constant, cutting out is proportional to the velocity of fluids passing through surface equipment. For the four completions, the pressure on the casing for the majority of the time was about 75 pounds. The separated gas discharged into a 65-lb. gas gathering system. Although there was some cutting out at the beans and the separator oil valves, this did not present a major operating difficulty.

3. Wetness of Oil

It is believed that it is good practice to circulate clean oil, i. e. oil not cutting over 3 % water. In the recent completions, if the formation was producing fluids having a greater cut than 3 %, the cut of the input fluid was maintained at less than the cut of the output from the well. In one well having a relatively high cut, the input fluid was changed to clean oil when the cut reached over 12%.

4. Probable Lack of Application of Sub-Pressure Drilling to Slanted Holes

One of the recently sub-pressure drilled wells was a hole which had been whipstocked. This well made more sand and more difficulty was experienced in running a liner than in any of the other completions. Two probable reasons for this are, (1) turbulence of the fluid may cause disruption of the walls of the hole which otherwise may not occur, and (2) dragging the tools along the lower side of the hole may be a cause of additional caving.

5. Balancing the Well to Run Perforated Liners

An operation, inconsistent with the theory of sub-pressure drilling is "balancing the well" in order to run a perforated liner. If a perforated liner is to be run and the well is flowing, the flow has to be stopped to get the liner into the hole. This is accomplished by either pumping in enough oil to balance the formation pressure or by setting a casing plug. In the four cases of running liners the well was "balanced" in each instance by pumping in dead oil. Although this procedure should not impose a pressure on the sand much greater than the formation pressure, it is contrary to the principle of "letting the well produce during the completion period".

6. Improbability of Successful Sub-Pressure Completion if Mechanical Difficulties Are Encountered

If mechanical difficulties are encountered during a sub-pressure completion which involve killing the well or the use of mud fluid in the hole, the purpose of a sub-pressure completion is defeated.

7. Quantity of Gas That Should Be Available

It is believed that for the type of completion made at Dominguez, 2½ million cu. ft. per day of gas should be available for circulating purposes. A shortage of gas handicaps operating procedure due to a limitation of lifting power.

Conclusion

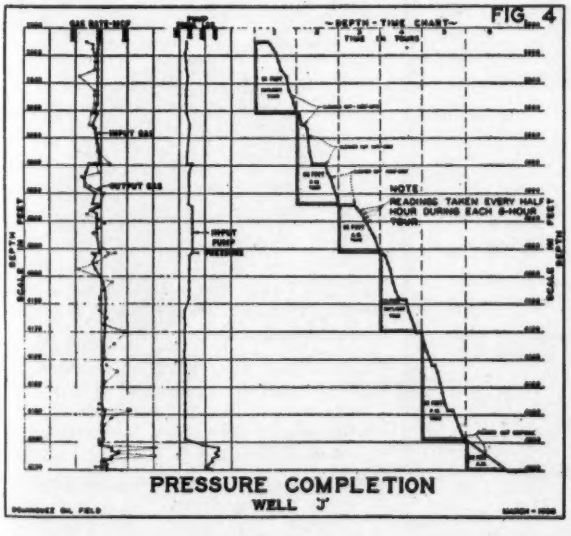
The procedure used in four recent sub-pressure completions at Dominguez has been outlined.

It is felt that the additional facilities required and the changes in practice occasioned by a pressure completion are justified only when sub-pressure drilling is accomplished. The use of oil, or oil and gas as drilling fluid is of no particular significance in itself. The primary objective is to reduce the pressure on the drilled interval to a point below the formation pressure.

This type of completion is in its experimental stage here and each well has witnessed some change in operating procedure. It appears that the maximum benefits to be derived are especially from wells which have highly permeable sands and from producing intervals that have been somewhat depleted. Additional completions by this method may tend to revise opinions as to the benefits to be attained. Additional completions will also provide an opportunity for the improvement of sub-pressure drilling practice.

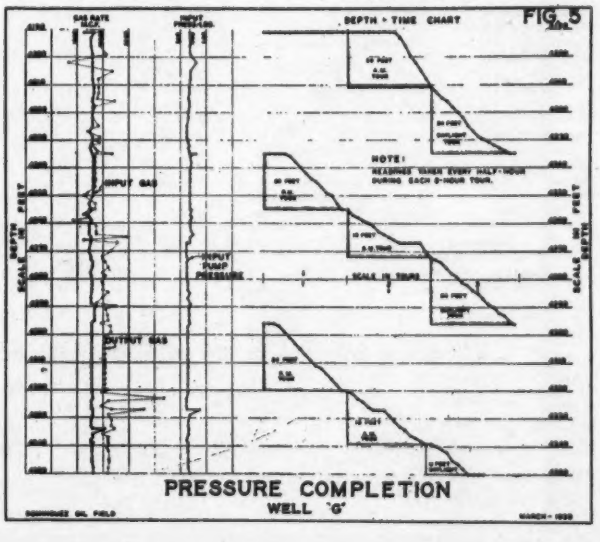
Presented at the
Spring Meeting of the Pacific Coast District
A. P. I. Division of Production
Los Angeles, California

FIG. 4



PRESSURE COMPLETION
WELL 'J'

FIG. 5



PRESSURE COMPLETION
WELL 'G'

State Drilling Report

Field	Company	Well	No.	Sec.	Twp.	Range
		NEW WELLS				
Wilmington	The Hancock Oil Co.	Harbor	B-18	2	5S	13W
	The Hancock Oil Co.	Harbor	B-19	2	5S	13W
	The Hancock Oil Co.	Harbor	B-20	2	5S	13W
	Macson Oil Co.	Macson	3	32	4S	13W
	Hogan Petroleum Co.	Graham	3	2	5S	13W
	Wilgate Oil Co.		1	33	4S	13W
	General Petroleum Corp.	P. C. Comm	1	2	5S	13W
	General Petroleum Corp.	S. P.	7, 8, 9 & 10	3	5S	13W
	The Superior Oil Co.	Backbay Tract	8	2	5S	13W
	Richfield Oil Corp.	P & G	5	2	5S	13W
	General Petroleum Corp.	Harbor Comm.	39	2	5S	13W
	General Petroleum Corp.	Harbor Comm.	40	2	5S	13W
	General Petroleum Corp.	Harbor Comm.	41	2	5S	13W
	General Petroleum Corp.	Harbor Comm.	42	2	5S	13W
Rosecrans	Barnsdall Oil Co.	Trust	3	18	3S	13W
	The Superior Oil Co.	Maxwell ComW.	8	19	3S	13W
Seepe	Claran Oil Co.	Hardison	1	22	4N	20W
Santa Maria Valley	Sunshine Oil Co., Ltd.	Wallace	4	27	10N	34W
	Greathouse Oil Co.	Fortier	1	27	10N	34W
	F. E. Jones	Wisconsin	2	27	10N	34W
	Union Oil Co.	McCoy-Cooney	1	27	10N	34W
	Selegna Petroleum Corp.	S. M.	1	26	10N	34W
Temblor	The Chico Martines Oil Co.	Holly	1	1	29S	20E
	Par-Mer Oil Co.	Kendon	1	25	29S	20E
Sunset	Standard Oil Co.	Monarch	11	7	11N	23W
Mt. Poso	Ring Oil Co., Ltd.	Shapiro	4	32	26S	28E
	Shell Oil Co.	Security	23	16	27S	28E
	Shell Oil Co.	Matthew Fee	6-A	4	27S	28E
Rio Bravo	The Superior Oil Co.	Wagner	4	35	28S	25E
	The Superior Oil Co.	J.I. & V.L. Geissinger	2	35	28S	25E
Ten Section	Shell Oil Co.	KCL-B	47-30	30	30S	26E
	Shell Oil Co.	KCL-B	58-30	30	30S	26E
Lost Hills	Randan Petroleum Corp.	Randan Pet. Corp. Theta	1	3	26S	20E
Round Mountain	Shell Oil Co.	Caldwell	20	7	20S	29E
	Crestmont Oil Co.	Staley	3	8	28S	29E
	Shell Oil Co.	Freeman	17, 18 & 19	20	28S	29E
Newhall	Palmluck Oil Co.		1	23	3N	16W
Huntington Beach	J. E. F. Oil Co.		1	36	5S	11W
Rio Vista Gas	Standard Oil Co.	Perry Anderson	2	1	3N	2E
		DEEPEN OR REDRILL				
Torrance	Neal H. Anderson		1	15	4S	14W
	Timco Oil Co.		1	14	4S	14W
	Consolidated Petroleum Co.		2	15	4S	14W
	Berken Oil Co.	Parsons	1	15	4S	14W
Santa Fe Springs	Ryan Oil Co.		2	6	3S	11W
	Bandini Petroleum Co.	Off	20	5	3S	11W
Wilmington	General Petroleum Corp.	Ford	39	4	5S	13W
Elwood	Southerude Oil Co.		191-2	25	4N	29W
Huntington Beach	The Texas Co.	Vollmer-Meyers	4	34	5S	11W
Long Beach	Shell Oil Co.	Wells	4	29	4S	12W
	Woolner Oil Corp., Ltd.	Leedom	1	19	4S	12W
	Armor Petroleum, Ltd.	Armor	B-1	24	4S	13W
	Exeter Oil Co., Ltd.	Clark	3	24	4S	13W
	Exeter Oil Co., Ltd.	Stevens	1	13	4S	13W
Montebello	Flanders and Brown	Walter	2	6	2S	11W
Potrero	Tidewater Associated Oil Co.	Cypress	4	34	2S	14W
Ventura	Tidewater Associated Oil Co.	V. L. & W.	31	24	3N	23W
Midway	North American Oil Cons.		18	2	32S	23E
	C. C. M. O. Co.		3	22	31S	22E
	Quality Oil Co.	W. P.	5	27	32S	23E
	The Texas Co.		31	32	32S	24E
	The Texas Co.		17	32	32S	24E
Sunset	Standard Oil Co.		203	5	11N	23W
Mountain View	O'Kane & Brain Inc.	A. E. Wright & C. W. Bloemer 1		30	30S	29E
Kettleman North	K. N. D. A.		-56	20	21S	17E
	K. N. D. A.		52 & 58	30	21S	17E
Coalinga	Shell Oil Co.		42	2	20S	15E
	Italo Petroleum Corp.	Empire	5	6	21S	15E
		ABANDON				
Santa Fe Springs	Rohde Oil Syn.	Rohde	1	6	3S	11W
Huntington Beach	H. H. Pierce & Co.	Plavan	1	10	6S	11W
Rosecrans	Delaney Petroleum Corp.	Mars	1	20	3S	13W
Ventura County	The Texas Co.	Edwards	1	19	2N	21W
Mt. Poso	W. P. W. Petroleum Co.	Packard	2	14	27S	28E
	Crestmont Oil Co.	Glide	1	19	26S	28E
	Shell Oil Co.	Matthew Fee	6	4	27S	28E
Greeley	Shell Oil Co.	KCL-1B	76-16	16	29S	26E
Playa Del Rey	Union Oil Co.	Del Rey	16	27	2S	15W
Midway	Loscal Petroleum Co.		3	23	31S	22E
Mountain View	Wood-Callahan	Porter	1	20	30S	29E
Kettleman North	Bandini Petroleum Co.	Whepley	1-A	35	21S	17E
Coalinga	Tidewater Associated Oil Co.		5-A	36	20S	14E
Rio Vista Gas	Amerada Petroleum Corp.	Happe	1	22	4N	2E

Summary	Week Ending April 30	Previous Week	To Date This Year	To Date Last Year
Total New Wells	24	20	402	486
Total Deepened or Redrilled	19	10	280	241
Total Abandoned	6	8	162	160

Fred G. Carter, for several years research engineer at the factory of the Fisher Governor Co., Marshalltown, Iowa, is now with Harry Dahl, Pacific Coast agent for the Fisher Governor Co. Mr. Carter will act as sales engineer in the local territory.

Chemists will have solved the problem of making use of annual crops as a substitute for coal, petroleum, and natural gas before these natural resources are exhausted, Dr. Frank C. Whitemore, president of the American Chemical Society, predicts.

California Crude Oil Production

For Two Weeks Ending April 23, 1938

Field	April Daily Quota	Average Daily Production	Excess
San Joaquin Valley			
Belridge—North	17,595	16,260	*1,335
Belridge—South	1,895	1,187	*708
Buena Vista	18,260	19,064	804
Canal	1,225	1,920	695
Coalinga—East-West	16,670	13,339	*3,331
Coffee Canyon	3,675	4,187	512
Edison	3,020	3,705	685
Elk Hills	8,595	11,147	2,552
Fruitvale	7,615	9,239	1,624
Greeley	4,190	3,351	*839
Kern Front	9,485	9,112	*373
Kern River	5,300	2,646	*2,654
Kettleman No. Dome	80,075	80,314	239
Lost Hills	4,665	3,688	*977
McKittrick	3,615	3,553	*62
Midway	47,860	54,739	6,879
Mount Poso	16,760	18,971	2,211
Mountain View	10,510	12,479	1,969
Rio Bravo	1,240	3,913	2,673
Round Mountain	11,350	12,835	1,485
Ten Section	6,255	6,204	*51
Other Fields	2,505	3,315	810
TOTAL	282,360	295,168	12,808
Coastal Counties			
Elwood	6,045	6,640	595
Rincon	2,800	3,800	1,000
Santa Maria	8,835	4,808	*4,027
Santa Maria Valley	10,000	10,004	4
Santa Paula-Newhall	5,360	5,303	*57
Ventura Avenue	35,960	37,066	1,106
Other Fields	6,455	6,733	278
TOTAL	75,455	74,354	*1,101
Los Angeles Basin			
Alamitos-Seal Beach	8,885	9,578	693
Brea-Olinda	8,920	5,953	*2,967
Coyote—East	3,020	3,315	295
Coyote—West	9,125	9,020	*105
Domingues	25,165	26,872	1,707
El Segundo	11,250	13,756	2,506
Huntington Beach—New	15,235	19,655	4,420
Huntington Beach—Old	14,450	16,153	1,703
Inglewood	15,900	15,842	*58
Long Beach	49,620	58,452	8,832
Montebello-Extension	8,095	8,917	822
Playa del Rey	6,620	6,542	*78
Richfield	8,750	9,193	443
Rosecrans-Athens	3,490	7,752	4,262
Santa Fe Springs	33,620	37,132	3,512
Torrance	7,285	7,448	163
Wilmington	64,105	99,158	35,053
Other Fields	2,430	2,739	309
TOTAL	295,965	357,477	61,512
STATE TOTAL	653,780	726,999	73,219

*—Shortage.

Shell Tide Tables Simplify Cruising

Something new in tide tables is just off the press, a handy pocket folder crammed with cruising information to answer almost any question for yachtsmen, sporting fishermen and commercial fishermen.

The new folder, issued by Shell Oil Co., comes in two editions. Instead of giving local information only, each edition covers hundreds of miles of coast and makes it unnecessary to carry an assortment of pamphlets dealing with each different bay and cove. One edition covers the area from Schuantanejo Bay, Mexico, to Cape Mendocino, California. The second gives complete facts about tides from Cape Mendocino to Puget Sound.

Copies of the new tide tables may be obtained on request at Shell marine stations and also at Shell service stations in fishing areas.

A NEW CORE ORIENTATION SERVICE

Sperry-Sun's Polar Core Orientation (U. S. Patents 1,792,639; 1,778,981; 2,089,216; 2,104,752; 2,105,650; and others pending) does not interfere with the progress of drilling. The orientation is determined in our laboratory, to which the selected cores taken by any type of core barrel in the ordinary course of drilling and properly marked, are shipped from any distances. No special equipment is required at the well, there is no loss of drilling time.

New Price List—May 1st, 1938

Self Checking SYFO Clinograph

Self-Checking Syfo Clinograph

A quick, inexpensive daily record of vertical deviation in drilling, without the use of dangerous acids. Used on wire line, as "Go-Devil" or on sand or bailing line. Fully patented.

Self Checking H-K Clinograph

Self-Checking H-K Clinograph

Designed for open holes only—providing permanent, accurate photographic records of inclination and direction on paper discs five minutes after removing instruments from hole. Fully patented.

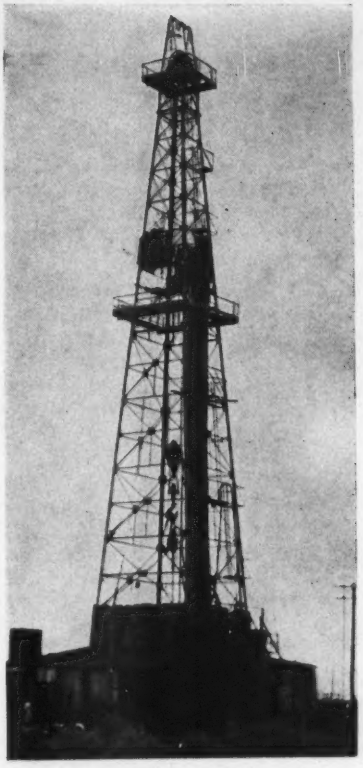
Setting a Remarkable Well-Surveying Record!

Continental Oil Company's world's record well at Wasco, California, was **Double Surveyed** to a depth of 11,500 feet with the "SURWEL" Gyroscopic Clinograph on a wire line—the deepest oil well survey ever made.

FROM THE LOG

In-run started at	10h 16m 35sec
Bottom reached at	11h 36m 12sec
Out-run completed at	12h 53m 47sec.
Total time for two surveys	2h 37m 12 sec.
Closure between In and Out-run	9.3'
Maximum temperature recorded	210°F.

Records taken every 100 feet.



Continental Oil — K.C.L.A. — 2 Wasco (near Bakersfield), California. The world's deepest well.

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provides a map of the well, photographically at all depths and affording a true picture of drilling progress for both direction and degree of vertical variation. Doubly checked against error by "in and out" survey. Speedy and accurate. Fully covered by patents.

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Lafayette, La.
Bank of Lafayette Bldg.

Santa Barbara, Calif.
1400 E. Valley Road

Long Beach, Calif.
549 East Bixby Road
(3800 Block—Atlantic Ave.)
Bakersfield, Calif.
c/o Elks Club
17th and I Streets

LAUGH THIS OFF

Our foreign correspondent, **Bill Saul,** tells us that in order to avoid building up excessive inventories of any commodity over in England, there is maintained in permanent office a trade commissioner who has the power to curtail production any time such a move seems advisable. This finally explains why we hear so much about the British Umpire.

And at a Monday morning pep meeting there is always a yawning gulf between the sales manager and the salesman.

Which recalls **Frank John's** famous remark about the speaker who was so tired he could hardly keep his mouth open.

The wink of an eye, according to the well known scientist, **Ray Pierson,** is precisely the same as the click of a camera shutter. It takes about one twenty-fifth of a second—but it takes about three days to explain it to the wife.

The better English campaign, by the way, is going merrily ahead. We noticed in an oil magazine the other day an account of a ball game between two local clubs in which the pitcher of one team had to retire from the game when he sustained "a severe Charles Horse."

And our Irish friend, **Joe Scanlon,** has always maintained that a real gentleman is a fellow who hurts you unintentionally.

Ron Smith, on the other hand, says there are lots of men who haven't the slightest interest in carpentry, and yet they spend their time juggling spirit levels.

A cafe up Bakersfield way has a card over the counter bearing this interesting legend: Use one lump of sugar, and stir like H——. We don't mind the noise.

The same concern claims that it has enough fresh eggs in the cellar to last two years.

Speaking of new fields, **Dick Shinn** says the greatest piece of undeveloped territory is right under your hat.

And we have a belated report to the effect that a pumper collapsed at Santa Fe Springs last week. It seems that he became overheated in the pump house.

According to **Wendell Jones,** an oil man with three good-looking blonds was waiting for a bus t'other evening. One came along, but merely hesitated while the driver popped out his head and yelled, "Full house." "Too bad," sez the oil man, "It's yours. I've just got three of a kind."

Now we interrupt the general trend to announce briefly that in spite of all the controversy, a suction valve is an open and shut proposition.

So is dental work. And, by the way, **Doc Curtis** out at Brea says if your tongue is coated, the best thing to do is brush it when you're brushing your teeth.

Did we ever tell you about the lad who made up his mind to be a dentist, and started in filling up holes on the highway?

And **Al Brown** writes to say that business is good up Coalinga way. He's got two hands back on his wrist watch, after being laid off all summer.

Al, incidentally, is perhaps the greatest artist the San Joaquin Valley has ever known. It seems to come natural to him to draw just the right thing every time, and he maks good money out of his drawing, too. He doesn't always draw, however, sometimes he gets the dough with a pat hand.

In a recent session with him we suffered severely from acute indiscretion.

One of **Red Wilson's** gaugers left a while ago for a job that paid him twice the money, and he has found out recently that he only gets it half as often.

The corpulent driller dashed up to the rig, and yells, "Did you guys see my belt around the dog house?" And **Roy Fry** says "No, but I imagine it could go, alright."

With which few remarks we must leave you. Remember that if your appearance is not all it should be, just get glasses and you'll look better.

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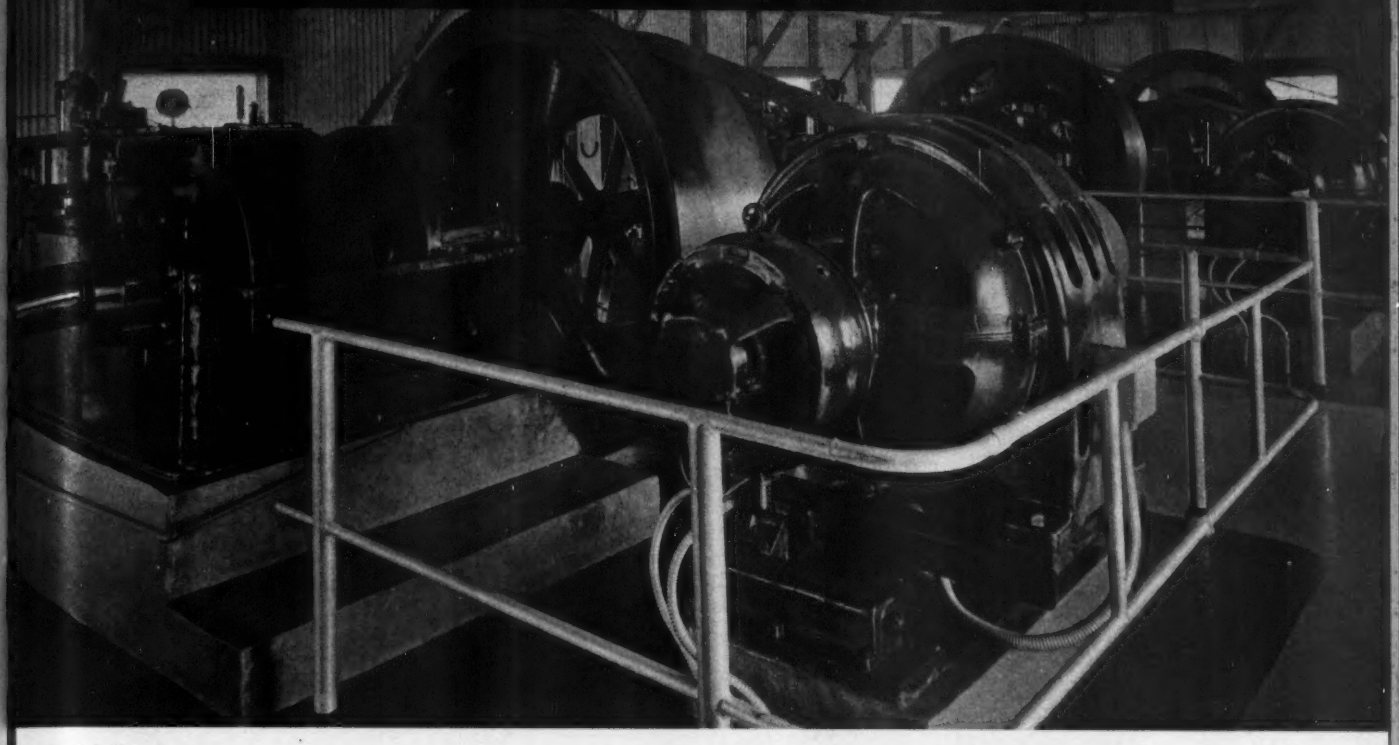

...ree—160 H. P. Natural ...s Engines Driving Three ...135 KVA Generators.

The entire power plant shown, including all auxiliary equipment, was furnished by VERNON Tool Company, Ltd. It generates all the electric current used for oil well pumping, well servicing, water well pumping and general electric service on the 225 acre Evans lease of the National Oil Company at the Midway-Sunset field. A similar plant has been in operation at National's Kern Front lease for 3 years—in the same service. These heavy-duty, slow speed engines furnish uninterrupted power on Natural Gas produced at the lease, and the entire plant is handled by the regular lease pumper. *This eliminates fuel and extra labor costs.* The *only* power expense is the small amount of lubricating oil consumed and miscellaneous supplies.

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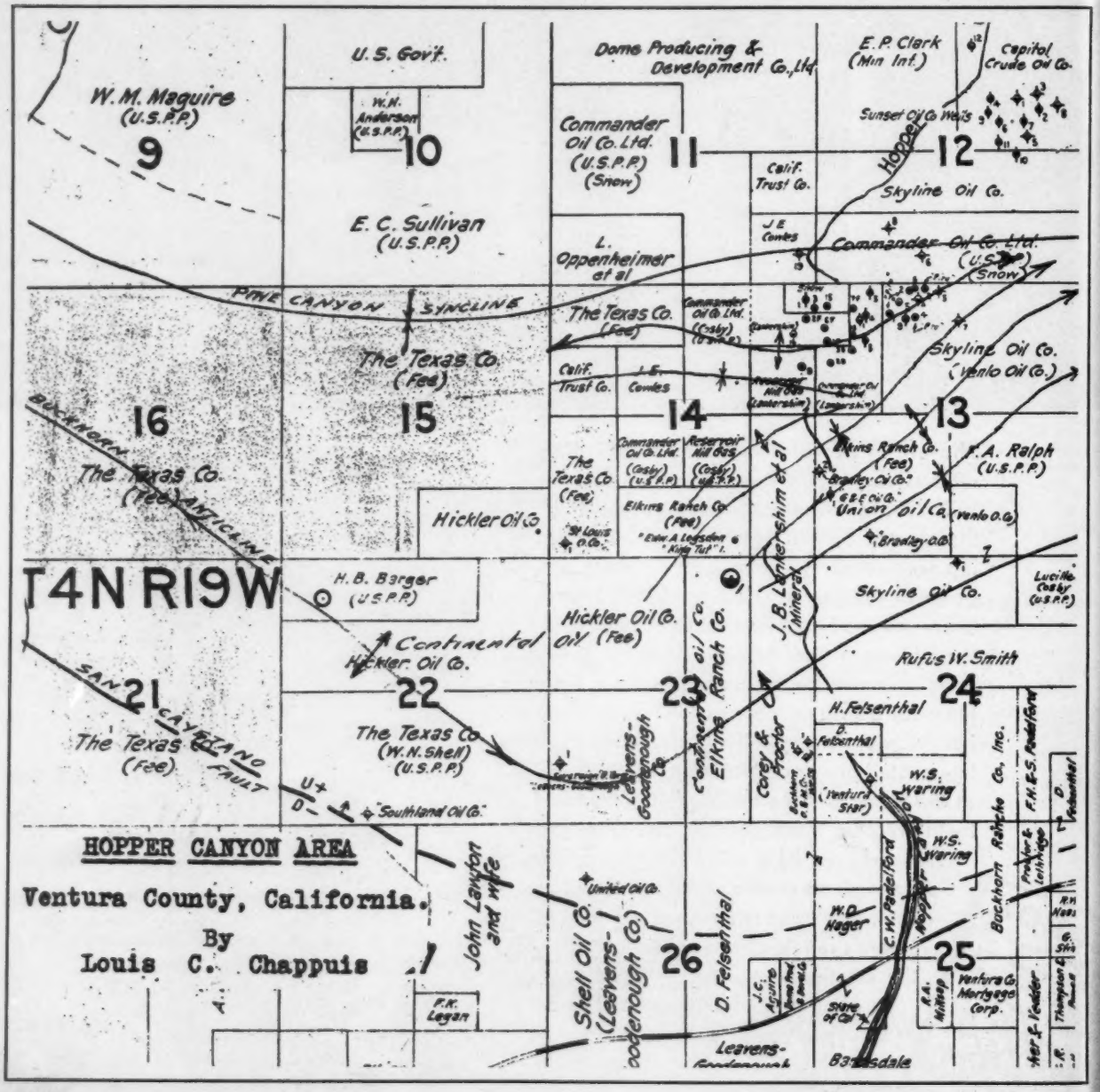
Hopper Canyon Area Development

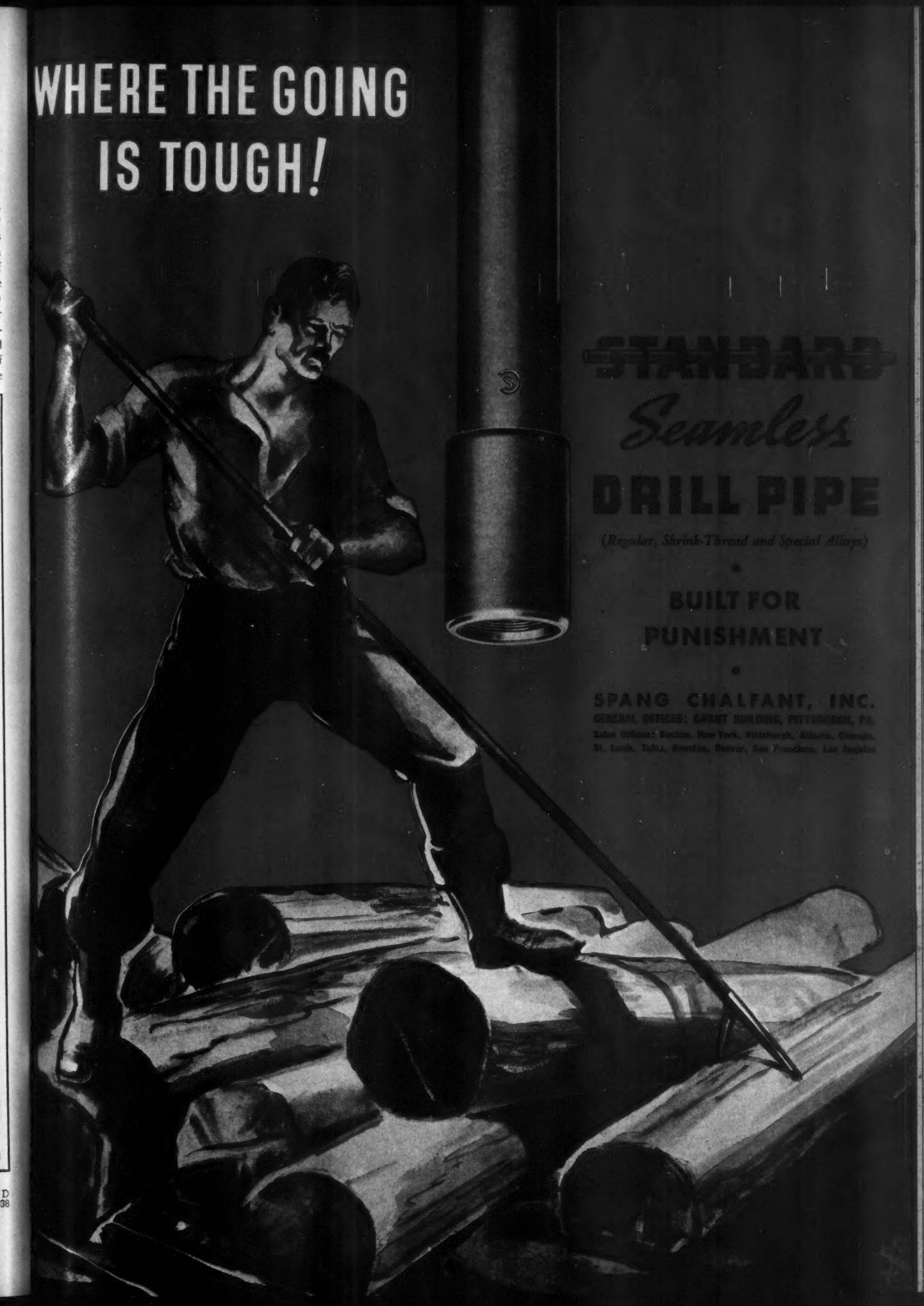
By Louis C. Chappuis

Mr. Chappuis, well known consulting geologist, will present from time to time in these pages thumb nail sketches of areas in California which offer opportunities to independent operators.

The early development in Hopper Canyon area was directly connected with the discovery of seeps and the subsequent drilling of shallow wells producing small quantities of heavy gravity oil. The importance of this area did not become known until after the Bardeen Oil Company in 1931 completed its first well with an initial production of 250 barrels per day of 32 gravity oil with a gasoline content of 44%. This well was completed from a depth of 2434 feet in the Temblor formation.

The Rocks exposed and unexposed in the Hopper Canyon area are those of Miocene, Oligocent and Eocene age. Sedimentary rocks of Upper Miocene and Pliocene age outcrop over the greater portion of this area. Unexposed rocks such as the Temblor, Vaqueros, Sespe and Tejon are of economic importance and will be found within the reach of the drill. In this area the Miocene rocks consisting of the Modelo, Temblor and Vaqueros formations attain a thickness of 6000+ feet. The Modelo formation of most Upper Miocene age is made up of siliceous shales, Limestone, Cherts and Silstone. The lower member consists of sandstone with numerous shale lenses, It is stained with bitumen on the structurally higher portions of the area. The Upper Shales of the Temblor formation (Middle Miocene) consists of brown shales with minor cherty shales, limestone layers and sandstone. (This formation yields small quantities of 16 gravity oil on some of the small subsidiary folds located on the

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north flank of the Buckhorn Anticline). The lower sandstone is very massive, containing minor amounts of conglomerate and shale. This horizon is productive of high gravity oil and it is from this formation that the present production from the Commander and Skyline Oil Company wells is obtained.

Below this sandstone member and still within the confines of the Temblor formation, one finds several hundred feet of bituminous shale. These shales appear to be the source beds for the oil found in the sandstone member above.

On what appears to be a conformable contact below the Temblor formation, a series of greenish gray sands, sometimes weathering buff to brown, dark gray shales and a number of limestone beds containing numerous characteristic fossils are found. Their thickness ranges from 350 to 500 feet. About one-half of the entire zone consists of sandstone. This formation known as the Vaqueros formation is also the source of high gravity oil found in wells to the north of this area.

The Sespe red beds of Oligocene age rest conformably under the Vaqueros formation. In this general area this formation attains a thickness of about 4000 feet, and consists of an alternating series of sandstones and shales. These rocks are variously colored red, green and brown. This formation comprises one of the chief sources of the oil found in this region. Approximately 50% of this formation consists of sandstone, and hence its reservoir capacity is very large.

The Eocene rocks (undifferentiated) are the oldest rocks which also have a bearing on the oil possibilities of this area. This formation in the area of Sespe Creek attains a thickness of approximately 5000 feet. There has not been sufficient work done on these series to determine definitely in what portion of the Eocene they belong, except that the upper portion can quite definitely be assigned to the Tejon member. These Tejon rocks in this general region consist chiefly of coarse, white, buff and gray highly indurated sandstones with minor intercalations of organic shales. The lower portions of the Eocene contain a much greater amount of shale. Some of this shale is highly laminated, very hard and contains a considerable percentage of organic matter. These lower shales are exposed in a number of canyons west of Sespe Creek.

Structure: The area under discussion is bounded on the north by the Pine Canyon syncline, and on the south by the San Cayetano thrust fault. The Pine Canyon syncline is a major structural depression with a general east and west trend and is traceable from Pine Canyon, west of Sespe Creek, on an easterly direction to Piru Creek. The San Cayetano fault strikes southeasterly from Sespe Creek traversing Pole Canyon on the northeast corner of section 20 T. 4 N. R. 19 W., crossing at the head of Fairview Canyon and taking on an easterly direction towards the area of Piru Creek.

Gerald Graham Morgan S. Burrowes Colin W. Timmons

Colin W. Timmons, recently elected president of American Pipe & Steel Corp., was formerly vice-president and general manager and has been with the company since 1925. Gerald Graham, now executive vice-president, came with American Pipe & Steel Corp. in 1928 to take charge of the oil field division. He became a director of the company in 1932 and general sales manager in 1935. Morgan S. Burrowes, secretary-treasurer, has been with the company 31 years.

The Buckhorn Anticline is the dominant structural feature of this area. This asymmetric fold lies midway between the Pine Canyon Syncline and the San Cayetano thrust fault as shown on the accompanying map. This anticline is traceable from the vicinity of Sespe Creek on a southeasterly direction to Sulphur Mountain, and thence northeasterly past Hopper Canyon into the area of Piru Creek, a distance of over eight miles. This fold which is of the asymmetric type is overturned in the vicinity of Hopper Canyon and has a mappable closure of well over 200 feet. The structural high being south and southwest of Sluphur Mountain.

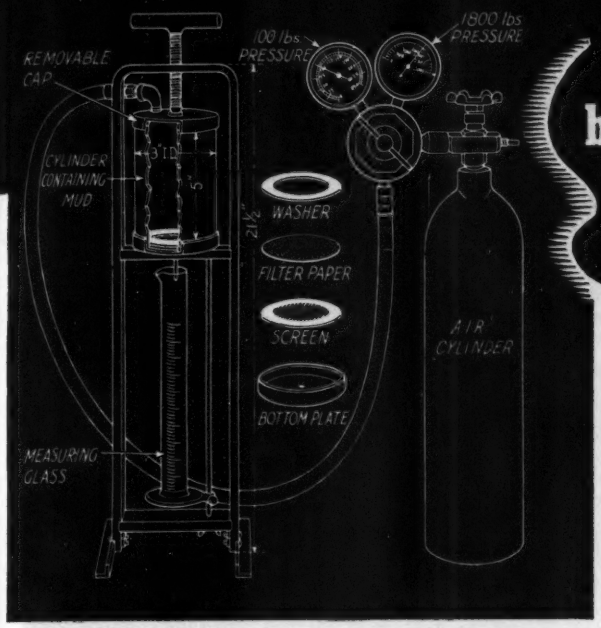
In the past, numerous poorly located test wells had been drilled on this fold to depths insufficient to have afforded adequate tests. Within the limits of the Buckhorn Anticline and on a poor location for a deep test the Soverign Oil Corporation in 1932 drilled "Levens-Goodenough" No. 1 Well. This well was located on the southwest quarter of section 23 T. 4 N. R. 19 W. This test well was carried down to a total depth of 3157 feet. Oil Sands were cored from 541 to 1077 feet. A test of these shallow sands gave negative results. At a depth of 1007 feet the well entered into a fault. At 3096 feet Pliocene rocks were penetrated, proving conclusively that this well had entered into the San Cayetano Fault, and consequently had drilled through all the Miocene rocks available at this depth. The well was abandoned as an inconclusive test of this structure.

At present the Continental Oil Company is drilling a well on the northeast corner of the Elkins Ranch in section 23 T. 4 N. R. 19 W. It is reported that this well will be carried down for a test of the Sespe formation and in all probability also the Eocene, unless a good commercial producer is obtained either from the Temblor or Vaqueros horizons. Taking into consideration the repuation and prestige behind this company when it comes to drilling deep wells, one cannot help but to expect very favorable results from this venture.

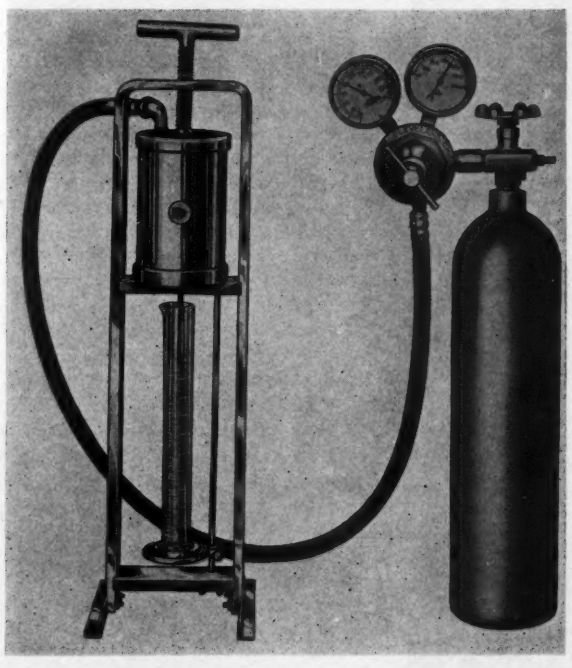
As previously mentioned the Bardeen Oil Co. in 1931 and 1933 completed two very good wells from the Temblor sands at depths ranging from 2434 to 3224 feet. These wells had initials of well over 200 barrels per day of 32 gravity oil with a gasoline content of 44%. During the early part of this year the Skyline Oil Co. completed a well from a depth of 2750 feet. This well at present is producing about 100 barrels per day of 29 gravity oil. All these wells are producing from a small anticlinal fold superimposed on the north flank of the Buckhorn anticline.

A successful completion by the Continental Oil Company of the Buckhorn anticline will be the bugle call for an intensive drilling campaign on this and many other structures located north of the San Cayetano thrust fault.

FILTER CAKE THICKNESS AND WATER LOSS INDICATE THE QUALITY OF DRILLING MUD



The BAROID Wall-Building Tester is simple to operate. About 600 c.c. of mud is placed in the cylinder, in the bottom of which is a filter paper and screen. One hundred pounds pressure applied from the air cylinder compresses the mud cake. The water loss is measured at desired intervals by means of a graduated cylinder. When the test has proceeded for a desired length of time, the mud is removed and the total water loss and cake thickness measured. Cylinder contains sufficient air for numerous tests.



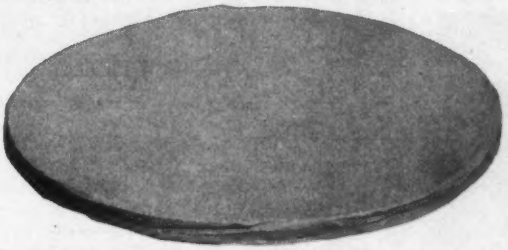
The BAROID Wall-Building Tester shown, which is particularly designed for field testing using 100 pounds pressure, is light (approximately 30 pounds), simple to operate and inexpensive. BAROID Wall-Building Testers, designed for pressures up to 2000 pounds and temperature control up to 200° Fahrenheit, are also available at all BAROID Sales offices.

This information can NOW be obtained easily and quickly at the well with the BAROID WALL-BUILDING TESTER

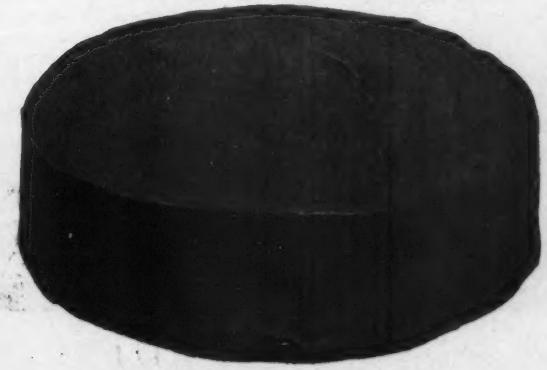
The whole process of mud testing has been simplified and clarified by the development of the BAROID Wall-Building Tester. Heretofore, field examination of drilling mud has meant a series of tests, none of which, by themselves, were wholly conclusive, and some of which were meaningless without careful interpretation. Tests of viscosity, gel-strength, weight, sand content, salt content, percentage of solids and colloidal content are each indicative of one or more characteristics of a drilling mud. No one of them determines definitely whether a mud is suitable. The summation of all these characteristics is the wall-building quality of a mud, which may be indicated by the thickness of the filter cake and the amount of water loss.

The BAROID Wall-Building Tester makes it possible to see the relative thickness of the cake actually being produced on the walls of the hole.

See BAROID Wall-Building Testers demonstrated at Booths 123-124-125, Oklahoma Bldg., International Petroleum Exposition, Tulsa. Illustrated literature on request.



Thin filter cake (actual size) deposited in BAROID Wall-Building Tester by a good mud having low water loss. This mud would keep a hole in good condition.



Thick filter cake (actual size) deposited in BAROID Wall-Building Tester by a poor mud. This mud would tend to cause "tight" hole and the high water loss would promote caving.

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Cut State Production Quota

Initiating a concerted drive to bring crude oil production from California fields more nearly into line with the needs of the industry's marketing machinery in the Pacific Coast territory, the Central Committee of California Oil Producers has sharply reduced the state's production quota for May.

In announcing the reduced quota, Lawrence Vander Leck, chairman, frankly stated that the curtailment body has become gravely concerned over the continued high rate of production from certain fields. They are of the opinion he said that unless the current rate of output from the state as a whole is reduced to a level somewhat approximating domestic and offshore marketing requirements a collapse of prevailing stabilized conditions is inevitable.

The production quota for May was set at not to exceed 620,000 bbls. daily, a reduction of 78,700 bbls. daily from the quota in effect during April of 698,700 bbls. daily. Of the quota set for May, the Committee reserved 4,135 bbls. daily to provide for new wells expected to be brought on production during the month, and allocated to individual fields a total of 615,865 bbls. daily.

During April the Committee allocated 653,750 bbls. daily for the 698,700-bbl. quota for that month, therefore the actual net reduction in the amount of oil allocated for May amounts to 37,885 bbls. bbls. daily.

Production from California fields currently is averaging about 720,000 bbls. daily, or 100,000 bbls. daily more than the May quota. While the flow currently is somewhat lower than in some recent weeks, it is still regarded as far in excess of economic levels.

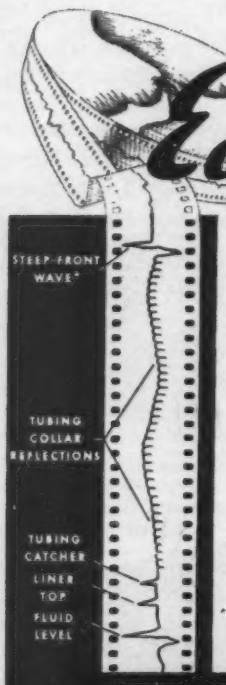
In explaining the action of the Committee, Mr. Vander Leck pointed out that available statistics show that the seven months ended Mar. 31, crude oil and products were added to storage each month in the Pacific Coast territory with something over 20,000,000 bbls. being added during the period, of which 14,000,000 bbls., or 155,500 bbls daily, were run to storage during January, February and March.

With reference to the decision of the Committee to reduce the production quota for May, it was pointed out that executives of two of the largest crude oil purchasing companies in California have issued sharp warnings on the present high rate of output. Additions to stocks over the past several months have not only proven a burden on the cash resources available for building up storage inventories not needed in operations but available storage facilities are rapidly being exhausted and tankage to accommodate further large additions to storage cannot be provided.

In addition to the purely physical and financial considerations bearing upon the present overproduction crisis, Mr. Vander Leck declared other factors far removed from the control of the oil industry are having a direct bearing upon industry's problems. Paramount among these is the continued business and industrial recession which is expected to greatly retard the normal seasonal increase in demand during late Spring and early Summer; and uncertanties in the continued takings of offshore buyers due both to the possibility of a cheaper source of supply elsewhere soon and to endangered credit conditions.

There was considerable discussion about the blowing of both wet and dry gas to the air in various fields of the State, particularly at Wilmington and Rosecrans. The Committee took cognizance of this waste of a natural resource and violation of the State gas law, and a resolution was adopted whereby a committee of three members was to investigate this wastage and violation of the law and present the facts to the State Oil and Gas Commission for appropriate action.

In discussing ways and means of reducing the state's production to the quota set and to alleviate the continued building up of surplus stocks, a resolution was adopted by the Committee asking for the cooperation of the purchasers and refiners to limit their runs to the assigned quotas. A committee of three, composed of Lawrence Vander Leck, J. R. Pemberton and W. H. Geis, was appointed to call upon the purchasing companies and determine their attitude in thus reducing their takings of crude oil. This action is in the form of a request from the producers represented by the Central Committee, to the purchasing companies, and is a measure made necessary by the large overproduction and is a part of the drastic action being taken, it was stated, by the curtailment authorities.



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Field Development

Los Angeles Basin

Eight Strings Working Pacific Dock Lease

Wilmington-Long Beach Harbor development continues at an even rate with approximately thirty drilling wells. Off nearly 10 from its peak, the present rate is maintained only by Richfield Oil Co.'s new campaign on the Pacific Dock lease, where eight strings of tools are now working. Reflecting to some extent the lowered rate of development, completions in the past two weeks dropped to a new low of 13, including one well which perforated in a higher zone.

Total field production at 102,000 bbls. daily remains dangerously high, but operators through co-operative effort are endeavoring to still further reduce the total output thereby remove the threat of lower crude prices.

General Petroleum Corp., whose seismographic survey and field work were responsible for the field's discovery, completed two Terminal and one Ranger wells. Harbor Community No. 11, near Sonoma and Alpine Sts., was finished at 3920 ft. with an initial flow of 2665 bbls., Southern Pacific No. 6, at the west end of 7th St., came in for 2500 bbls. from 4075 ft. and the Ranger well, Ford No. 38, yielded 1025 bbls. with bottom at 3000 ft.

Two larger Terminal zone wells were placed on production by Hancock Oil Co. Harbor No. F-8, located near Seaside Blvd. east of Kern Place, flowed initially at the rate of 5000 bbls. from three zones while Harbor A-14 in the shipyard was rated at better than 3000 bbls. The wells were bottomed at 4035 and 4050 ft. respectively.

Two Terminal Island wells were brought in by Union Pacific Railroad; No. 83 being completed at 3933 ft. with an initial of 2900 bbls. and No. E-3, on Edison Co. property, starting off at the same rate.

Raising the total number of producers on City of Long Beach land to eight, The Termo Co. finished wells No. 3 and No. 4 with typically large yields. They are located south of the Edison plant and were bottomed at 3900 ft.

The Texas Co. bottomed its third refinery site well at 3445 ft., and after gravel packing the liner, is pumping to the sump. D.H.C. No. 18, Bankline Oil Co.'s newest well north of Anaheim Blvd., is on production from 3313 ft. with the rate yet unestimated. Silver Gate Oil Co. obtained a 275 bbl. yield from well No. 1, located at "G" St. and Banning Blvd. and finished at 3125 ft.

When production in Nelson A-6 fell under 100 bbls., Sunray Oil Co. gun perforated the 7-in. casing between 5100 ft. and 5265 ft. increasing the flow to 450 bbls. of 29 gravity clean oil. The well is 5660 ft. deep and has 7-in. casing including 105 ft. perforated landed on bottom and cemented through perforations 5549 ft.

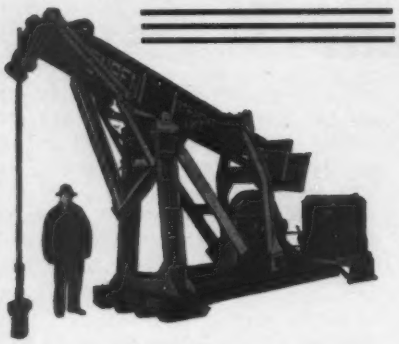
Richfield Oil Co. is now one of the largest scale operators in the field. At present writing, the company is completing two Terminal zone wells on the Proctor & Gamble lease, No. 26 on the Pacific Dock property and Gurnsey No. 1, the last two in the Ranger zone.

LOS ANGELES BASIN WILDCATS

Los Angeles County

Area	Well	No.	Section	Depth	Status
Bellflower	Clayton, Geo. L. Scott	1	32, 3-12	6820	Idle
Brea	Pressel, Perry, Tull	1	30, 2-9	4560	Idle
Castaic	Royal Land Corp.	1	8, 4-17	555	Drilling
La Mirada	Carmenita Oil Co., Ravera	1	21, 3-11	50	Idle
Lomita	D & B Oil Co.	1	25, 4-14	3720	Drilling
Monterey Park	Monte Cristo, Garvey	1	27, 1-2	4860	Drilling
Mint Canyon	Christien, J. P.	1	7, 4-14		Rig
	Mint Canyon Oil Co.	1	33, 5-14	1860	Idle
Newhall	Barnsdall Oil Co. R.S.F.	3	26, 4-17	4450	Drilling
	National Pet. Corp.	1	27, 4-16	2475	Drilling
	Palmluck Oil Co.	1	23, 3-16		Rigging up
Palmdale	Antelope Valley Pet.	1	17, 6-12	50	Idle
Palos Verdes	Gene McLaren	1	27, 4-14	3992	Idle
	Rolling Hills Pet.	1	27, 4-14	4220	Idle
Pico	British Am. O. P. Co.	1	12, 2-12	4250	Drilling
	A. S. Johnston, Univ. Cons., Pico	1	5, 2-11	5480	Drilling
Pico Canyon	Burt, A. G.	1	36, 4-17	2550	Idle
San Fernando	Tidewater Assoc. Porter	1	27, 3-16		Location
Towsley Canyon	Towsley Canyon Oil Co.	1	8, 3-16	4100	Pumping
W. Long Beach	Pioneer Petrol Corp.	1	26, 4-13	5023	Drilling
Whittier	Fullerton Oil Co., Whittier	5	25, 2-11	2325	Abandoned
	Langstaff, Geo. W. Iliff	1	8, 2-11		Rigging up
	San Bernardino				
Chino	So. Counties Pet. & Drlg. Co.	1	26, 2-8		Rig
	Orange County				
Anaheim	Shell Oil Co., Weisel	1	16, 4-10		Rig
Kraemer	Congress Oil Co., Kraemer	1	36, 3-9	3017	Idle

General Petroleum Corp. has only four wells actually drilling and one in process of completion. Union Pacific Railroad, whose recently issued statement for 1937 showed a net profit of $428,521 from Wilmington oil operations, has only three wells making hole and three being readied for completion. Hancock Oil Co. is drilling four wells, all in the central "Hot Spot" and destined for the Terminal zones. Bankline Oil Co. is inactive at the present and Superior-Jergins are working on only one project, Backbay No. 8.



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Caminol Test Marks Alamitos North Limit

The north limit of Alamitos production in the new Long Beach extension area is fairly well defined by the failure of Caminol Co.'s Dominguez No. 1-8 to find productive sands. After a short period of idleness at 4850 ft., the well is now being deepened by Hilldon Oil Co. in search of Miocene production. The latter company, whose exploration work developed the area, completed Pool No. 1 at 4100 ft. flowing initially at the rate of 950 bbls. of 24 gravity clean oil, making it one of the best in the field. On the same lease, Hilldon is drilling No. 2 below 3800 ft. and is rigging up No. 3. Richfield Oil Co., Bixby No. 5, is drilling at 3678 ft. and its neighbor, A. S. Johnson Drilling Co. No. 33, is preparing to run casing. Hard luck still is following Signal Oil & Gas Co.'s P. E. No. 1, the hole now being redrilled to sidetrack a drill pipe fish.

In the old portion of Los Cerritos, Chicksan Oil Co. recompleted Wolter No. 1 at 6600 ft. as a small pumper. Exeter Oil Co. is preparing to spud a new "grass roots" job at the corner of 31st St. and Elm Ave. Shell Oil Co. is completing Alamitos No. 44 from 5300 ft. and Texas Co. is drilling Wilson Fee No. 1 below 3320 ft. Near the corner of Willow St. and Walnut Ave., D. D. Dunlap Oil Co. finished well No. 13 at 4135 ft. with initial production unestimated. The 8⅝-in. water string was set at 4053 ft.

Del Rey 16 Dropped By Union at 6106 Ft.

Union Oil Co. has finally abandoned Del Rey No. 16 in the old Venice-Del Rey field after a redrill job failed to encounter productive horizons. Located on the east side of the 518 acre Del Rey Company lease, the new hole was carried to 6106 ft. where the project was abandoned after penetrating the schist 25 ft.

Whittier Boundary Test is Abandoned

Fullerton Oil Co. abandoned Whittier No. 5, a core hole and prospect well combined, at 2325 ft. Located in the se¼ of sec. 25,2-11, only a few streaks of unsaturated oil sand were encountered. It is possible that other wells may be drilled in the area to determine the true course of the fault forming the north boundary of the old Whittier field, and to fully investigate the possibilities of an eastern extension of the producing limits.

Torrance Hot Spot Center Of Interest

Suddenly changing from mediocrity to an area offering real returns, the Torrance "Hot Spot" is now justifiably in the center of the Los Angeles Basin spot light.

Previous to the last fortnight only a bare, very bare, handful of wells had been completed with yields warranting the feverish activity in the field, but now things are different, much different. Within four days, five wells were completed with initial productions ranging from 180 bbls. to nearly 600 bbls., all flowing and only one showing water. Four of these wells are located near the intersection of 230th St. and Pennsylvania Ave., the fifth and smallest being C.C.M.O. Co.'s Torrance No. 14 at Sepulveda Blvd. and Pennsylvania. That the Del Amo zone becomes progressively more sandy down structure from the discovery well, Del Amo No. 23, was pointed out by J. A. Bermingham, Jr., in the April 5th issue of The California Oil World, a fact which accounts for the better than average output from these wells which are the southernmost in the area. Largest of the recent completions was that of Archie A. MacDonald and E. Robert Burns who deepened Moore No. 3 to 5040 ft. and with the lower 120 ft. open obtained an initial flow of 591 bbls. of 26.6 gravity clean oil through a 34/64-in. bean. This well is said to have cored more and better oil sand than any yet drilled in the new zone. Peso Oil Co. No. 1, located across 230th St. to the north, bottomed at 5013 ft. and, also with 120 ft. open, completed with first gauges running 400 bbls. of clean oil. On the east side of Pennsylvania Ave., Summit Oil Co. brought in its first well from 5005 ft. flowing at the rate of 350 bbls. per day, while still farther to the southeast, Sierra Development Co. finished Weiller No. 1 at 5015 ft. flowing 270 bbls. The initial cut of 15% is apparently diminishing. Chanslor-Canfield Midway Oil Co. carried Torrance No. 14 to 5018 ft, and gun perforated casing between 5000 ft. and 4840 ft. After more than a week, production is holding close to the 180-bbl. initial.

Stimulated by these recent successes, several new operators have entered the field with the intention of deepening old holes and the Texas Co. is building rigs for two new wells on the Wilson Community lease. With activity moving to the south, it is only a quesetion of time until the edge water is reached. In the meantime it is possible that larger wells will be completed.

Cement Failures Mar Montebello 5th Zone

Indicating that the new "fifth zone" in the Montebello west end is not wet, St. Helens Petroleum Co. brought in Monterey No. 24 flowing 4200 bbls. of 36.3 gravity oil cutting 2.5% with over 3,000,000 cu. ft. of gas. Shortly after completion, however, the cut increased to 7%, possibly due to partial failure of the cement. From the difficulty so far experienced, it is evident that a thorough study must be made of the cement problem in this field, there being far too many failures to date. St. Helens' next completion will be Monterey No. 25 which set casing at 5385 ft. and is now coring into the zone. With bottom at 5500 ft., the well flowed at the rate of 600 bbls. on a 12 hour formation test. No. 26, now below 5400 ft., is preparing to run casing and No. 27 is drilling at 3110 ft. The company is rigging up Eggleston No. 1, located north of Lincoln Ave.

McVicar & Rood, deepening the old Manz well near the corner of Maple and Lincoln, found the top of the zone and cemented casing at 5400 ft. level. Completion of this well will be the go signal for several independent operators holding drill sites nearby.

Union Oil Co., with good luck on the water shutoff test, will soon have Paul Howard No. 1 on production. The casing now being tested is 8⅝-in. and was cemented at the shoe at 5399 ft. and through perforations at 4190 ft. It is planned to run a perforated liner and complete at the present depth of 6245 ft.

Union's Wilcox No. 1, most easterly well south of Lincoln Ave., ran a formation test of the interval 5635-5735 ft., recovering oily mud and water. The company's third well, Howard & Smith No. 1, is drilling below 1650 ft.

Standard Oil Co. has only one active well in the area, Harvey No. 2, which is drilling at 3153 ft.

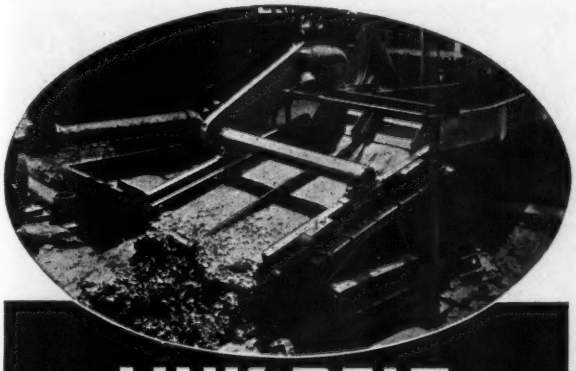
Most important in determining the extent of the new zone is Brookline Oil Co., Drake Community No. 1 located on Maple north of Beverly Blvd. Not yet deep enough to be informative, the last reported bottom was 3525 ft.

With four wells now drilling and another rigging up, the Rosecrans field is experiencing its greatest activity in many months. Barnsdall Oil Co. and Union Oil Co., developers of the new 7600 ft. production, are working on one well each, the latter company's Rosecrans No. 19 being the closest to the goal at 7340 ft. Universal Consolidated Oil Co. is drilling a new well, No. 3, on the Trust lease and Howard Oil Co. is redrilling the Union Oil Co. Gordon No. 1, abandoned at 6640 ft. years ago.

Huntington Beach Deep Test Small

Huntington Beach's latest deep test, W. P. R. Oil Co. No. 1, has been plugged back from 7410 ft. and is pumping an estimated 60 bbls. a day cutting 10%. Following its success in recompleting Pearce No. 1 at 4000 ft. pumping 110 bbls. of 21 gravity clean oil, Texas Co. is starting work on a new well, Pearce No. 3. These wells are located south and west of the intersection of Huntington Ave. and Clay St. in the old field.

J. E. F. Oil Co., Schaaf No .1, northeast edge well, is reaming to bottom at 4400, having encountered a small body of oil sand. Armor Petroleum Co. has recompleted the old Ambassador No. 11 in the 1800 ft. horizon pumping 50 bbls. of heavy oil. Near the reservoir in the center of the old field, Adolph Thomas is deepening an old well. The Termo Co., McIntyre No. 1, recently recompleted at 5200 ft., is pumping 200 bbls. daily.



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San Joaquin Valley

New Deep Oil Field Discovery Seen

In November of 1937, Ohio Oil Co. brought in the Canal oil field. In May, 1938, the same company will bring in another field of major importance. K. C. L. A-8, deep test of the Buena Vista gas area, topped an oil bearing sand equivalent to the Stevens horizon of Ten Section and Canal, at 10,022 ft. and to bottom at press time, 10,152 ft., had cored a total of 98 ft. The well, surrounded by relatively shallow gas producers, so far has uncovered sufficient zone to predict that the new discovery will be fully the equal of any of the recently developed valley floor fields. Present plans call for deepening through the oil sand strata before a production test is made, meanwhile no doubt exists the minds of company officials regarding the well's possibilities.

The potential new field is located seven miles due south of Ten Section and ten miles southeast of Elk Hills, the discovery well being in sec. 32, 31-26.

Deep Discoveries Featuring Valley

Deep exploration, based on seismographic surveys, has in the last two years proved the existence of far greater reserves in California than had heretofore been dramed of. The flat floor of the San Joaquin Valley has been found to be ideally adapted to this type of geophysical work and the rapid development of mechanical means to drill straight holes economically to great depths has resulted in the discovery of six new fields of major importance, including the two deepest in the world.

The first of the series was Ten Section, discovered by Shell Oil Co. with the completion of KCL No. 1 in June, 1936, flowing 750 bbls. of 61 gravity oil. The well is located in sec. 29,30-26 and was originally bottomed at 7888 ft. Following this first discovery of deep oil production in the valley floor, new impetus was given to this typé of wildcatting which resulted late in December of the same year in bringing in the Greeley field by Standard Oil Co. The first well, KCL 11-1 in sec. 19,29-26, was completed at 7807 ft. with an initial flow of 2600 bbls. of 37 gravity oil and the use of the seismograph as a means of locating oil structures was thoroughly established in California. Nearly a year passed without further major discoveries until Union Oil Co. in November of 1937 completed Kernco No. 1 in sec. 34,28-25 at 11,302 ft., a new record for commercial oil production. Union's Rio Bravo discovery flowed initially 1500 bbls. of 39 gravity oil through a ⅛-in bean.

Rio Bravo was closely followed in the same month by the completion of Ohio Oil Co., KCL E-3, located two miles northwest of Ten Section in sec. 14,30-25. Bottomed at 8175 ft., first production gauged 2300 bbls. of 37 gravity oil. Now termed the Canal field, the producing limits are unknown and may eventually form a northwest extension of Ten Section.

January of 1938 saw the completion of Standard Oil Co. KCL 15-1 in sec. 27, 30-26 and the discovery of the Canfield Ranch field. With bottom at 8140 ft. and plugged to 8072 ft., the well flowed 286 bbls. of 27.5 gravity clean oil. Although only two miles due east of the heavy production encountered at Ten Section, an 8860-ft. dry hole was drilled between. One location to the southeast, Standard has started a second well.

Most recent and most far reaching in importance is the Wasco discovery of Continental Oil Co. During the drilling of KCL No. A-2, almost a complete geologic section of the valley floor was

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SAN JOAQUIN VALLEY WILDCATS

Fresno County

Area	Well	No.	Section	Depth	Status
Coalinga	Conlon, J. M.	1	25, 19-14	100	Idle
	Petroleum Sec., Gatchell	2	18, 20-16	6860	Standing cmtd
	Shell Oil Co.	36–1	36, 19-14		Rig
	Diamond	1	35, 20-14	175	Drilling
	Sec. One	1	35, 20-14	1365	Testing
E. Coalinga	Pure Oil Co., SPL	1	31, 18-17	10861	Fishing
Clovis	Central Valley Oil Co.	1	1, 12-20	588	Idle
Jacalitos Hills	Jacalitos Pet. Co.	1	14, 21-15	5745	Idle
	Dauphin Dev., Boone	1	30, 21-14	3780	Redrilling
Panoche Hills	Panoche Hills Oil Co.	1	12, 14-11	635	Fishing

Kern County

Arvin	General Pet. Co., Pauley	1	22, 31-29	500	Idle
	Petrex, Inc.	1	32, 31-30	3635	Idle
	Union Oil Co., Berry	1	15, 31-29	6812	Drilling
Belridge	General Pet., St. Helens	1	12, 28-20	8710	Fishing
	Ohio Oil Co., Ford	1	6, 29-22	6895	Drilling
Buena Vista	Ohio Oil Co., KCL	A-8	32, 31-26	10011	Drilling
Comanche Point	Hall-Baker Co.	1	35, 32-29	2770	Drilling
Devils Den	Amerada Pet. Co., Beer	5	22, 26-19	8006	Drilling
	Gibson Oil Co., Alferitz	3	14, 25-18	350	Drilling
	Little Major Oil Co.	1	36, 25-18	250	Idle
Dominion	Dean, Geo. W.	1	26, 26-28		Rig
Edison	British Cons. Oil Co.	1	11, 30-30	100	Idle
	Johnson, G.W. Brown-Paulette	1	33, 29-30	1027	Idle
	Stevens, Ray	1	22, 30-30		Rigging up
	Wood, Callahan, Porter	1	20, 30-29	4190	Abandoned
Fruitvale	Texas Co., Norris	1	7, 29-27		Location
Grapevine	Richfield Oil Corp.	KCL-1	28, 11-20	1583	Redrilling
Lerdo	Standard Oil Co.	KCL 18-1	29, 28-26	7525	Drilling
McFarland	Tidewater Assoc. O. Co., Pond	1	17, 26-25		Location
	Shell Oil Co., KCL	83–35	35, 26-25		Grade
Poso Creek	Reynolds Oil Co.	1	30, 27-27	2855	Cleaning out
	Harkness & Laws, Hunt	1	28, 27-27		Foundation
Richgrove	Dilamar Oil Corp.	1	15, 25-27	2956	Cleaning out
	Quinn	3	15, 25-27		Location
San Emigdio	Shell Oil Co.	KCL 4-26	26, 11-22	8910	Drilling
Temblor Hills	Chico Martinez-Exeter	1	1, 29-20	1066	Cleaning out
	Holly	1	1, 29-20	550	Drilling
	Par-Mer Oil Co., Kendon	1	36, 29-20		Rig

Kings County

Pyramid Hills	Pyramid Prod. Co., Retherford	1	27, 24-18	3090	Idle
Kettleman	Temblor Oil Co., Bunting	1	25, 23-18	9138	Plug 7815—Idle

Tulare County

Ducor	Crusaders Oil Co.	1	1, 24-27	57	Idle
Tipton	Magnet Oil Co., Glaze	1	15, 22-26	3282	Abandoned

taken, giving for the first time an actual picture of the sedimentation of the San Joaquin Basin. Bottomed at 15,004 ft., successively penetrated were the sands and shales of the Pleistocene, Pliocene, Miocene, Oligocene and Eocene. Though oil showings were found in all formations, the Rio Bravo equivalent in the Middle Temblor offered the best possibilities and was tested first, resulting in the completion of the well with a potential of over 3000 bbls. from the interval 13,092-13,175 ft., a depth eclipsing the former effective depth record by more than 1500 ft.

Three new seismographic locations have just been made by as many major companies. In the McFarland area, Tide Water Associated Oil Co. is grading roads preparatory to starting work on Pond No. 1 in sec. 17,26-25 while Shell Oil Co. is erecting a derrick for KCL No. 83-35 in sec. 35,26-25. Northwest of Fruitvale, Texas Co. has chosen a location for Norris No. 1 in sec. 7,29-27.

As the percentage of "hits" credited to geophysics is rapidly rising, it is easily possible that one or more new discoveries may result from these tests as well as from others now under way.

Ramsey 1 Tops Rio Bravo Pay

Geo. F. Getty, Inc became the third operator and Ramsey No. 1 became the sixth well to reach the oil sands in the celebrated Rio Bravo field. Encountering the top at 11,375 ft., hole was carried to 11,390 ft. before setting the water string. Located in sec. 35, 28-25, Ramsey No. 1 is about half way between the closely grouped wells in the discovery area and the newly completed outpost, Superior Oil Co. Ruhl No. 1 in sec. 1, 29-25.

Completion of Superior Oil Co.'s Ruhl No. 1, outside of Continental's deep discovery at Wasco, is the one most important recent development in the San Joaquin Valley. Extending production more than a mile to the southeast, the well shows the field to be probably large in area and the depth at which production was found indicates a closure of at least 160 ft., assuming the discovery well to be on the highest point. Should the structure be a regular anticline, trending northwest-southeast, with Union's Kernco No. 34-1 at the apex and Superior's Ruhl No. 1 at the southeast extremity, it would be logical to assume that production would extend an equal distance to the northwest, forming a total productive area of less than three miles in length. That such an estimate is too conservative is indicated by other foldings in the Temblor which are known to be of much greater extent.

Although no official figures have been released, Ruhl No. 1 is believed to be 11,544 ft. in depth and to be flowing 1500 bbls. per day from a 140 ft. interval below the shoe of the water string.

Prospect Old Area In Sec. 28, 30-22

South of McKittrick a new company, Pasadena Oil Co., is preparing to spud an interesting well on the old Pioneer lease in sec. 28,30-22. Located near the apex of the structure, the new well adjoins an old hole, which though junked, flows sulphur water and a small quantity of heavy oil.

Wheeler Ridge Test Progressing Slowly

Richfield Oil Corp., KCL No. 1, avowed deep test of Wheeler Ridge, has encountered considerable difficulty in maintaining a vertical hole in the steeply dipping beds of the flank of the structure.

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Gatchell 2 Centers Interest In Coalinga

Since the alleged discovery of oil sand in Petroleum Securities Co., Gatchel No. 2 in sec. 18, 20-16, eyes of all California oil men have been on the Coalinga area. Although the well is now suspended at 6850 ft. after cementing a string of casing near the top of the Eocene, interest is sustained by the campaign of the Shell Oil Co. to find shallow production. Having been active in the region for the past several months, Shell is drilling a second test in sec. 35, 20-14 after a bailing test showed the first well incapable of production.

Magnet Oil Co. has obtained a large block of leases centering around sec. 18, 20-15 and plans on starting work in the near future.

Another Deep Test In Fruitvale Area

Another deep valley floor test is scheduled to be drilled in the vicinity of Fruitvale. Following the northweset trend, the Texas Co. after many months of exhaustive geophysical work has chosen the site for the new well on the Norris property in sec. 7,29-27. Recent showings in Standard's KCL 18-1, sec. 29,28-26, near Lerdo, have lent encouragement to the favorable results of the seismographic survey.

Seaboard Oil Drops West Mt. Poso Test

Finding the Vedder zone unproductive at 2607 ft., Seaboard Oil Corp. has abandoned its west Mt. Poso test, Glide No. 1 at 2832 ft. Located 860 ft. north and 2260 ft. east from the southwest corner of sec. 7,27-28, showings were no better than those found in two previously drilled wells in the same section. In the northwest corner, Shell Oil drilled to 1861 ft, in 1928, while seven years later Stevens Oil Corp. carried a test to 2631 ft.

San Emigdio Test Drilling at 8910 Ft.

Shell Oil Co.'s San Emigdio test, KCL No. 1-A, sec. 26-11-22, is fast becoming one of the deeper active wildcats in the Valley. Outlook for the well is not considered particularly rosy as to the last reported depth of 8910 ft., showings had not been encouraging.

Test Suspended In Sec. 6, 31-22

Par-Mar Oil Co., having suspended its McKittrick well in sec. 6,31-22 at 3118 ft., is now preparing to drill a wildcat in the Temblor Hills. Equipment is being installed for the new test which is located in sec. 36,29-20. Six miles north in section one, Chico Martinez Oil Co. is drilling Holly No. 1 in hard shale below 575 ft., while the company's first well, Exeter No. 1, pumps intermittantly.

Glaze 1 Dropped In Sec. 15, 22-26

Glaze No. 1, drilled to the granite at 3282 ft. by L. E. Turner and later taken over by Magnet Oil Co., has been abandoned after final tests produced only water with a trace of oil. The original operator plugged bottom to 28000 ft. to test showings encountered at that level but found only water entering the hole. After standing idle several months, Magnet reconditioned the hole to the plugged depth

Bandini Abandons Sec. 35, 21-17 Test

After several months of hard work, Bandini Petroleum Co. has given up attempts to carry Whepley No. 5 to the Eocene deep sand in Kettleman Hills. Beset with mechanical difficulties from the time the old abandoned Tide Water Associated hole was entered, the redrill and deepening job was taken to 9500 ft. at which point further efforts appeared to be unwarranted. An easterly edge well in sec. 35, 21-17, Whepley No. 5 was originally completed in the Temblor at 8387 ft. and was abandoned by Associated when production turned water.

Abandon Porter 1 In Sec. 20, 30-29

Failing to find productive sands between Edison and Mountain View, Wood-Callahan Oil Co. has abandoned Porter No. 1 in sec. 20,30-29. To bottom depth of 4187 ft., several oil showings were noted but nothing that appeared in any way to be commercial.

Coastal District

14 Wells Drilling In Ventura Avenue

Ventura Avenue, scene of several good completions of late and the most important field in the coastal district from standpoint of production, is also one of the busiest. A total of 14 wells are now being drilled with activity scattered generally throughout the field. Large in area, the "Avenue" has a tremendous thickness of oil sand, producing wells varying in depth from 4000 ft. to over 10,000 ft. and is one of the world's first pools to yield commercially from the latter depth.

Most active in development work at present is Tide Water Associated Oil Co. with eight strings of tools now working and locations selected for three more. Recently completed by the company was Lloyd No. 138 at 9945 ft. With 1300 ft. of perforated liner on bottom, initial production was gauged at 2800 bbls. with over 3,000,0000 cu. ft. of gas. Pinched back with a 28/64-in. bean, the well flows 1690 bbls. of 31.5 gravity clean oil with 750 lbs. on the tubing and 2000 lbs. on the casing. Also on production is V. L. & W. No. 31 which is flowing 1135 and cutting 12% from 7150 ft.

Next in point of development is Shell Oil Co. with one new well each on the Gosnell, Edison and Taylor properties. In addition, work is scheduled to start on another, Taylor No. 95, immediately.

General Petroleum Corp. is spudding Barnard No. 18 and is making a production test in Notten No. 13.

Headed by Ralph B. Lloyd, Lloyd Corp. is drilling an important outpost well, which, if successful will open a wide territory now held by independent operators. Production is now entirely in the hands of major companies.

Three Good Producers In Old Rincon District

Promising renewed activity for the old Rincon field, Chanslor-Canfield Midway Oil Co. recently brought in three excellent flowing wells. Hobson B-20, with bottom plugged to 4535 ft., was finished flowing nearly 600 bbls. a day through a 32/64-in. orifice while B-19 from 4111 flowed 400 bbls. Last of the three is B-22 which is flowing 265 bbls. from the interval 4114-4240 ft.

Texas to Test King City Area

Renewal of oil interest in the vicinity of King City is seen in the recent announcement of the Texas Co. of a new exploratory test to be drilled in sec. 13, 19-5. The location, falling approximately 15 miles northwest of the city, is on a hitherto unprospected structure and is the result of extensive field work.

Four New Locations In Santa Maria

Three wells officially completed and four new locations summarizes events of the past two weeks in the Santa Maria Valley field. Not truly represented, however, is the completion picture as several wells are now being brought in. Wells now on production are Sunshine Oil Co., Wallace No. 3, bottomed at 4578 ft., and good for 1100 bbls.; Hauoli Oil Co., Holser No. 1, 4790 ft. deep and initialling 450 bbls. and Wilson Oil Co., Beaufoy No. 1, an 800-bbl. well finished at 5382 ft. The Hauoli and Sunshine wells are located in sec. 27, 10-34 while Wilson Oil offsets California Lands, Inc. Gallison lease in sec. 26. Now being completed are Gallison No. 4 and McDonald No. 1 of California Lands; Geo. F. Getty, Inc., Vicente No. 4; Wisconsin-Waddell No. 2 of F. E. Jones; Signal Oil & Gas Co., Yelkin No. 1 and Union Oil Co., Stinson No. 1.

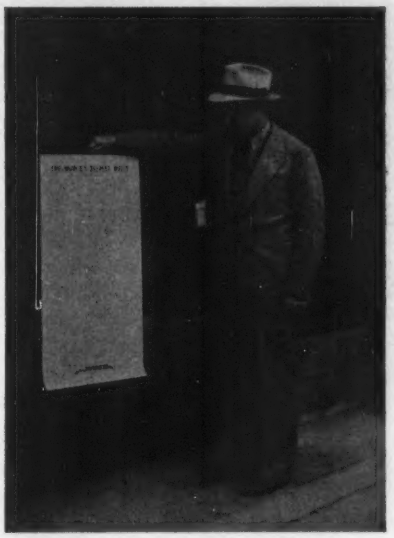
New wells have been recently located by Union Oil Co. on the Wheat lease in sec. 22 and the Frank Vicente property in sec. 21. Greathouse Oil Co., a newcomer to the field, is preparing to drill Fortier No. 1 in sec. 27 and Pacific Western Oil Co. has foundations in for Carranza No. 2 in sec. 28.

NORTHERN COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Glenn	Ohio Oil Co., Willard	2	18, 20-2	1500	Drilling
Humboldt	The Texas Co., Eureka	2	22, 3-1	7708	Plug 6473-Shut in
Monterey	The Texas Co., Lewis	1	13, 19-5		Location
San Mateo	Wilshire Oil Co., Cowell	1	20, 6-5	8007	Idle
Solano	Amerada Pet. Co., S. & S.V.	2	18, 14-3		Rig
	Richfield Oil Co., Potrero	1	10, 4-1	1150	Drilling
	Standard Oil Co., Anderson	1	1. 3-2	4458	Testing
Sutter	Buttes Oil Fields, Ltd.	3	2, 15-1	6954	Shut in

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Santa Barbara County					
Carpinteria	Carpinteria Oil Co.	1	32, 4-5	2250	Drilling
Cat Canyon	Standard Oil Co., Los Flores	1	27, 9-33	5530	Redrilling
Garey	Valoco Oil Co., Haslam	1	28, 10-33	1655	Idle
Gaviota	Gaviota Oil Co., Hollister	1	35, 5-33	3205	Shut in
	Wilshire Oil Co., Hollister	1	35, 5-33	3603	Drilling
Gato Ridge	Field, O. C., Continental	3	9, 8-32		Rig
	Petrol Corp., Tognazzini	1	9, 8-32	2612	Completing
Los Olivos	United Western, Bradley	1	15, 7-30	3100	Drilling
Orcutt	Bankline Oil Co., Silva	1	7, 9-33	3092	Drilling
	Warren Deuel, Garrett	1	12, 9-34		Rig
Refugio	Tweedy, A. E., Penn.	1	34, 5-31	1700	Idle
Summerland	Gauthier Oil Co.	17–1	22, 4-26	1400	Idle
San Luis Obispo County					
Edna	Loma Grande Oil Co., Lewis	1	28, 31-13		Rigging up
Elk horn	Calif. Prod. Co.	1	6, 10-24	1550	Redrilling
	Western Plains Oil Copr.	1	7, 31-21	4010	Idle
Paso Robles	Ajax Land & Dev. Co., Moss	1	27, 26-13	475	Idle
	Vanguard Oil Co.	1	14, 27-14	4360	Idle
Ventura County					
Camarillo	So. Calif. Drlg. Co., Daly	2	26, 2-21	3090	Idle
Oxnard	Oxnard Oil Co., Vanoni	1	10, 1-22	6302	Plug 6200—Idle
	Walter G. Rowe Johnson	1	15, 1-22	4173	Drilling
Ojai	High Mesa Oil Co.	1	16, 4-22	1375	Drilling
Red Mountain	Arnett, Frank E.	3	15, 4-21	1167	Drilling
Sespe	Commander Oil Co., Temescal	7-F	13, 4-18	215	Idle
	Condor	1	6, 4-19	2195	Idle
	Continental Oil Co., Elkins	1	23, 4-19	3080	Drilling
	Garmack Oil Co.	1	28, 5-19	565	Idle
	Crosby	1	14, 4-19		Grade
	La Salle & Van Dissen	1	15, 5-19		Grade
	Merchants Pet., Cochran	8	1, 4-20	320	Drilling
	Speik Oil Co.	1	33, 5-19	3440	Idle
	Terry, Geo., et al	1	23, 5-20	1340	Idle
	Williamson Oil Cl.	1	1, 4-20	540	Idle
Simi	Trucano, Germanina	1	5, 2-17	1007	Idle
South Mt.	The Texas Co., Richardson	5	13, 2-21	4335	Drilling
	Clipper Oil Co., Scheiferle	1	17, 3-20		Rig material
Tar Creek	Section 20 Oil Co.	1	20, 5-19	1580	Idle
Timber Canyon	Stallings, Senter, Ahlberg	1	24, 4-21	675	Idle



Patterson-Ballagh Corp. has just published a wall chart bringing up to date all of the data on the wells drilling in the world deeper than ten thousand feet. This chart not only shows the Continental well and details of its production, casing, etc., but all of the wells in the various States. Free copies of this chart will be mailed to those requesting them from the Patterson-Ballagh Corp., 1900 East 65th Street, Los Angeles, Calif.

Standard Oil Co. is nursing along its interesting Lerdo wildcat, KCL 18-1, sec. 29, 28-26, testing formations carefully on the way down. To the last reported bottom at 7535 ft., these tests are said to have been somewhat disappointing, but the possibilities have in no sense been exhausted.

Rio Vista, Solano county, continues to be the busiest gas field in the state. Standard Oil Co. is preparing to complete Perry Anderson No. 2, sec. 35, 3-2, at 4460 ft. after setting casing at 4270 ft. Amerada Petroleum Corp. is starting a second well on the Sacramento & San Joaquin Irrigation District lease in sec. 18, 4-3. Richfield Oil Co. is drilling a wildcat, Potrero Hills No. 1, located 5 miles west of the proven field.

One of the biggest surprises in many months was staged by Tide Water Associated Oil Co. at Potrero when Cypress No. 4 was recompleted flowing 415 bbls. of 48 gravity oil and 90 bbls. of drilling mud. Drilled last fall to 5815 ft., the hole was plugged to 4500 ft. and the well completed as a small producer.

Williamson New O. P. A. President

Lloyd Williamson

Lloyd Williamson, vice-president and general manager of the California Star Oil Co., one of the original oil producing companies in the state, was elected president of the Oil Producers Agency of California at the annual election meeting of the Board of Directors, recently.

Mr. Williamson has been in the California oil business since 1910, and has been with the present company 24 years, having started as a tool dresser in 1914. He is, in addition to being the new president of the Oil Producers Agency, an organization of more than 300 California independent producers, a vice-president of the Kern County Chamber of Commerce, clerk of the Midway School Board, and has been prominently identified with various civic groups in the San Joaquin Valley.

In addition to the new president, the Agency Board also elected H. A. Bardeen, Bardeen Oil Co.; Angus Crites, Anchor Oil Co.; Robert Garrison, Macroo Oil Co.; A. S. Johnston, A. S. Johnston Drilling Corp.; W. J. Schultz, Crescent Petroleum Co.; and Roy W. Young, Young Petroleum Co. as vice-presidents, to fill vacancies created by the expiration of terms of incumbents.

A new secretary-treasurer and assistant secretary-treasurer were also elected, former being Melville Dozier, Jr., Texas Holding Co., and the latter W. A. Russell, Seaboard Oil Co.

Rush M. Blodget, executive vice-president of the Agency since its inception, was again re-elected. Eleven directors whose terms had expired with this meeting were all re-elected, and will serve for an additional three-year term. These men are: A. E. Bell, A. E. Bell Corp.; Rush M. Blodget, Oil Producers Agency of California.; J. J. Doyle, Doyle Petroleum Co.; W. H. Geis, Arrowhead Oil Co.; R. E. Havenstrite, Cal. Western Oil Co.; L. C. Kelly, Thos. Kelly & Sons, Inc.; C. A. La Fever, Huntington Signal Oil Co.; A. C. Mattei, Honolulu Oil Corp.; W. H. Morgan, R. R. Bush Oil Co.; W. J. Schultz, Crescent Petroleum Co.; Lawrence Vander Leck, Fullerton Oil Co.

Jack J. Doyle, retiring president of the Agency, was presented with a token of appreciation of his services during the past twelve months by R. A. Broomfield, president of Barnsdall Oil Co., on behalf of the Board of Directors.

Other business coming before the meeting consisted principally of a progress report to the Board by Executive Vice-president Blodget on the various projects in which the Oil Producers Agency is active. These included plans and studies for lowering independent oil company costs of workmen's compensation insurance, drilling bonds, and various other forms of insurance and bonds. Other business was of a routine nature.

Baker Exhibits Wash-Down Whirler

Special emphasis in the Baker Exhibit at the Tulsa International Petroleum Exposition will be placed upon the newly developed and improved Wash-Down Whirler Equipment, including the Baker Cement Wash-Down Whirler Float Shoe and Baker Cement Wash-Down Whirler Guide Shoe.

The occompanying illustration of the Wash-Down Whirler Float Shoe clearly shows the side ports which lead out of the valve chamber, and are baffled to direct any fluid downwardly. When circulating, while running in the role, the whirling, hydraulic action imparted to the fluid effectively washes away the bridges that may be encountered, and the formation thus removed is circulated up the hole as the work proceeds.

The whirling action is also effective in washing the side walls of the hole, but any tendency toward breaking down the side wells of the hole is prevented by the **downward**, rather than **outward** turbulence as the fluid leaves the shoe.

When cementing operations are commenced, the Down-Whirler principle insures a free movement of the cement slurry and greatly increases chances for complete encasement of the pipe with a uniform body of cement, with possibility of channelling reduced to a minimum.

A unique demonstration unit which clearly illustrated the Wash-Down Whirler action will be included in the Baker exhibit, and this modern contribution to better cementing should be found both interesting and instructive.

Lane-Wells Doubles Sales First Quarter

Showing a gain of over 49%, total sales of Lane-Wells Co. amounted to $561,249 during the first quarter of 1938, as compared with $376,604 for the company and predecessor companies during the first three months of 1937, it was announced today by Walter Wells, president.

Total sales during March, 1938, totalled $220,421, as compared with $150,246 in March, 1937, and $174,106 in February, 1938. This represents the 61st consecutive increase in monthly sales as compared with the same month a year previous. Figures on net income are not available on a quarterly basis due to the international character of the company's operations.

Pittsburgh Equitable For Stupakoff Gauges

It has just been announced that the Pittsburgh Equitable Meter Co. of Pittsburgh, Pa., have been appointed sole distributor for the Stupakoff Bottom Hole Pressure Gauge and Bottom Hole Sampler

The Stupakoff Laboratories of Pittsburgh, Pa., have been manufacturing and marketing these devices for several years, during which period they are said to have met with considerable favor by production engineers and geologists throughout the industry.

In commenting upon this latest addition to the EMCO line, Colonel W. F. Rockwell, president of Pittsburgh Equitable Meter Co., said:

"A study of these devices by our company has indicated that their design is fundamentally sound and that they provide a degree of accuracy in making bottom hole determinations not previously available. Stupakoff Laboratories are ideally equipped to handle the precision workmanship required in their manufacture. We, in turn, through our wide acquaintance with the Oil Industry, believe that we can better serve potential users by acting in the capacity of sole distributor for this equipment."

Oil men attending the International Petroleum Exposition in Tulsa are invited to inspect these products in a special exhibit at the Hall of Science where cutaway samples will be on display.

Gasoline Sales Drop In March

A sharp reduction in gasoline sales during March is announced in a report by the State Board of Equalization, showing a tax assessment levied against the distribution of 135,243,235 gallons.

The tax for the month amounted to $4,057,297.05, a loss of 6.51% compared to the same month of 1937.

Despite the reduction in comparison with last year, the March income from the gasoline tax was substantially higher than the income of $3,564,705.33 reported for February, 1938. During the three months of the current calendar year a gain has been shown only in February sales, the report said.

Oil companies reporting sales of more than 300,000 gallons in March were listed by the Board with the explanation that resale of gasoline previously taxed or exempt sales to the federal government or interstate commerce accounted for differences between total and taxable sales.

These companies were as follows:

Name	Gallons Actually Sold	Net Taxable Gallonage
Aromalene, Inc.	727,994	588,906
Bachmann Petroleum Corp.	1,252,851	1,222,079
Bankline Oil Co.	333,527	6,105
Barnsdall Oil Co. of Calif.	374,799	None
Belridge Oil Co.	1,845,272	7,100
Brown, Henry, dba. Operators Oil & Refining Co.	728,350	728,350
Caminol Company Ltd. The	2,246,099	2,146,764
Chanslor-Canfield Midway Oil Company	725,684	None
Coline Gasoline Corporation	331,650	3,343
Cowan Oil and Refining Co.	815,445	None
Del Rey Oil & Gas Company	783,757	None
Eagle Oil and Refining Co., Inc.	813,223	807,085
East West Refining Co.	908,872	908,872
Edington Oil & Ref. Co., Ltd.	304,792	304,792
El Camino Refining Co.	681,429	638,827
Elm Oil Company, Ltd.	402,374	402,374
El Tejon Oil & Refining Corp.	718,457	709,922
Envoy Petroleum Company	824,860	824,860
Estado Petroleum Corp.	1,688,232	1,687,928
Exeter Refining Co.	1,080,283	1,080,243
Fletcher Oil Company	2,274,721	None
F. R. Long, Inc.	1,435,930	None
General Pet. Corp of Calif.	29,944,316	10,599,685
Gilmore-Dabney, Inc.	588,022	None
Gilmore Oil Company	2,871,871	70,516
Hancock Oil Co of Calif., The	4,385,353	3,053,000
Harbor Refining Company	598,164	556,424
Honolulu Oil Corp., Ltd.	766,863	10,144
Krieger Oil Company	715,644	709,514
Lomita Gasoline Company	1,482,690	None
Los Nietos Producing & Refining Company, Ltd.	2,945,341	619,686
Macmillan Petroleum Corp.	2,840,515	2,649,130
McCallen, M. M. dba. M. M. McCallen Ref. & Producing Co.	1,135,186	961,058
Mercury Petroleum Corp.	380,349	380,349
Moffett, J. O. (San Fernando Refining Co.	316,324	316,312
Mohawk Petroleum Co.	2,831,359	2,781,034
Mohawk Petroleum Corp.	696,343	663,531
Norwalk Company, The	2,114,750	1,570,040
O. C. Field Gasoline Corp.	2,376,366	138,917
O. F. Collinge, Inc.	689,765	None
Ohio Oil Company, The	329,454	None
Olsen, G. A., Receiver, Sunland Refining Corporation	616,004	None
Olympic Refining Company	1,805,919	1,803,855
Pacific States Oil & Terminals Co.	2,275,046	2,274,721
Pacific Western Oil Corp.	709,291	1,001
Petrol Corporation, The	2,063,710	1,129,020
Petrolane, Ltd.	350,380	235,836
Richfield Oil Corp.	15,384,851	12,759,206
Rio Grande Oil, Inc.	4,285,814	None
Rothschild Oil Company	725,146	725,146
R. R. Bush Oil Company	1,063,639	1,063,025
Seaside Oil Company	3,717,973	1,451,130
Shell Oil Company	29,730,753	15,542,782
Signal Oil and Gas Co.	1,593,009	None
Signal Oil Company	5,145,128	None
Socal Oil & Refining Co	743,222	743,222
Standard Oil Co. of Calif.	50,875,990	19,163,701
St. Helens Pet. Co., Ltd., The	953,162	952,916
Sunset Oil Company	2,450,379	None
Superior Oil Company	2,383,765	49 922
Texas Company, The	8,517,240	6,706,014
Tide Water Associated Oil Co.	24,056,102	11,630,714
Triangle Oil & Ref. Co., Ltd.	633,540	633,540
Union Oil Co. of Calif.	21,078,332	12,247,469
Walter Steiner Refining Co.	309 334	309.334
West Coast Refining Co.	372,073	None
Western States Gasoline Corp.	3,506,515	81,391
Wilshire Oil Company, Inc.	7,825,501	7,587,839

An upturn in El Segundo activity has resulted from the recent good completion by Soverign Oil Co. in the townlot section of the field . Having skidded the rig from the first well, Soverign is rigging up Elsie Community No. 2 at the intersection of Bungalow and Grand while cross the street, Apex Petroleum is preparing to spud No. 3.

Ohio Oil Co., in the older part of the field, is drilling Gough No. 12 below 6000 ft.

Name Howard Pyle Coast A.P.I. Chief

At the alumni meeting of the American Petroleum Institute, Pacific Coast district, division of production, held in Los Angeles, Apr. 19, Howard C. Pyle, production engineer, Union Oil Co. of California, was elected chairman for the coming year. Mr. Pyle was graduated from the University of California in geology and petroleum engineering in 1926, and joined Union Oil Co. as geologist in the following year. After spending some time in exploratory work in South America, he returned and was given geological assignments in San Joaquin Valley, Northern California, Canada, Oregon, and Washington. He is at present in charge of production research for the company, and the excellence of his work has gained him nation-wide recognition as an authority on core analysis, bottom hole pressures, and reservoir conditions.

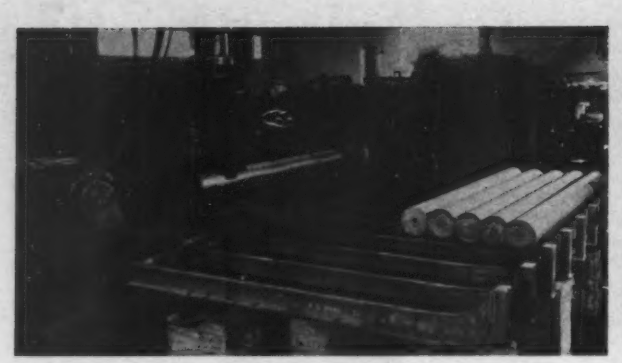
Varec Expands To Meet Demand

Steady and substantial increase in the demand for "Varec" tank equipment is being met by the Vapor Recovery Systems Co. of Compton, Calif., by an expansion program that includes the addition of 15,000 sq. ft. of shop floor space and the tripling of present office space and facilities. The capital outlay for new buildings and machinery will total between $25,000 and $35,000.

According to Frank V. Long, president, 168 complete vapor recovery systems have been installed in the Long Beach area in recent months. Orders are being booked from Canada, Roumania and Poland, and with the approach of winter in the Southern Hemisphere, complete systems are being installed in Peru, Bolivia and other South American countries.

Many units of standard type machine tools, including lathes, boring and milling machines, drill presses, etc., have been ordered, and some have arrived before the completion of the new building.

A digest of new legislation affecting highway users, the final "1937 Laws Bulletin" has been published by the National Highway Users Conference.



These peelers remove about one-fourth inch of the metal, cutting off the light surface cracks which heretofore were chipped out by hand and exposing any deep defects.

A pierced tube on the conveyor table between the No. 1 piercer (rear right) and the No. 2 piercer (front left) in the Youngstown Sheet & Tube Company's new seamless pipe mill.

New Seamless Pipe Mill Built At Youngstown Sheet And Tube Plant

A new mill for making 4½ to 14-in. seamless pipe, the first large seamless tube mill in this country in over seven years, has just been put into operation at the Youngstown, Ohio, plant of The Youngstown Sheet and Tube Co.

The new mill is part of a general development and improvement program just completed in Youngstown Sheet and Tube's seamless pipe division which included the installation of a new 35-inch rounds mill for rolling round pipe billets, two huge "peelers" which automatically "skin" steel billets to remove surface defects, two new 50-ton-per-hour billet heating furnaces, the largest of their kind ever built, and two new pipe piercing mills that are masterpieces of engineering ingenuity.

Latest developments in design are incorporated in all the new equipment, from blooming mill to automatic pipe length recorders, which features to a far greater degree than ever possible before precise automatic control of operations.

So sweeping and revolutionary are the improvements of the new mill over anything that has ever been built that it replaces a comparatively new mill built only twelve years ago. The new mill has a rated capacity of 300,000 tons per year.

The steel used in the manufacture of pipe on the new mill is especially selected open hearth steel. Ingots of this special steel are reheated in a battery of thirty-two soaking pits and rolled into blooms on a recently reconditioned 40-inch blooming mill.

In making billets 5¾ to 13½ inches in diameter, steel from the 40-in. blooming mill is rolled into rounds on the new 35-in. rounds mill. In making 3¼ to 5¾-in. billets the larger rounds are brought back for further reduction. They are first allowed to cool, then are pealed, reheated in the new furnace and passed again through the rounds mill, this time to be rolled down to furnace and passed again through the rounds mill, this time to be rolled down to size suitable for finishing of a 24-in. merchant mill.

The two peelers which take the large rounds after cooling on the cooling beds, remove the light surface cracks which heretofore were chipped out or scarfed by hand and expose the deep defects which show up as black marks against the bright surface of the newly cut metal. In this way all exploratory chipping to find deep defects is eliminated. About ¼ in. of the metal is removed by the cutters.

In the steel yard at the piercing mill the rounds are loaded on two loading docks, one in each bay of the building, and sent by roller conveyor to the billet reheating furnaces, which are continuous furnaces of the "walking beam" type. The furnaces are 25 ft. wide and 80 ft. long, the largest of their kind ever built. Each furnace has a capacity of 50 tons per hour.

The two piercing mills which pierce the solid billets and roll them into rough tubes are masterpieces of modern engineering. Heavy main castings and extensive use of roller bearings combine to give these units extreme solidarity and stability and freedom from vibration never before possible on mills for such work. With these and a host of other improvements that make for increased speed and greater accuracy, operators can work to closer tolerances than heretofore possible on any mills of similar size. The main housings which weigh 119 tons each are the heaviest ever built for a seamless tube mill.

The white hot tube is lifted by a new type "kick-off" mechanism onto the table (left foreground) and taken to the No. 2 piercer by roller conveyor (left center).

New tube piercing units in the seamless pipe mill, the first built in this country in over seven years, has a rated capacity of 300,000 tons per year.

PRODUCTION :-: DEVELOPMENT

(Figures of Production and Stocks are in barrels of 42 Gals.)

	Total Production March	—DAILY AVERAGE— Mar., 1938	Feb., 1938	Mar., 1937
Group No. 1				
Belridge—North	469,447	15,143	15,123	15,071
Belridge—South	45,433	1,466	1,618	2,027
Canal	38,840	1,253	1,310	.....
Canfield Ranch	4,963	160	124	.....
Coalinga	354,136	11,424	11,148	14,918
Edison	120,983	3,903	3,708	4,737
Elk Hills	344,725	11,120	11,048	9,333
Fruitvale	278,083	8,970	9,310	8,823
Greeley	102,107	3,294	3,676	435
Kern River	439,265	14,170	14,719	15,251
Kettleman Middle Dome	2,212	71	80	184
Kettleman North Dome	2,550,181	82,264	80,416	77,048
Lost Hills	120,161	3,876	3,696	3,999
McKittrick	116,760	3,766	4,318	1,987
Midway-Sunset	2,192,580	70,728	74,394	69,159
Mountain View	390,840	12,608	13,512	20,309
Mount Poso	613,463	19,789	20,463	17,061
Rio Bravo	31,066	1,002	1,672	.....
Round Mountain	529,906	17,094	17,340	11,218
Ten Section	162,337	5,237	4,578	1,541
Wheeler Ridge	9,564	309	313	337
Group No. 2				
Capitan	96,594	3,116	3,022	2,063
Elwood	222,522	7,178	7,697	9,419
Rincon	116,888	3,770	3,604	2,402
San Miguelito	93,231	3,008	4,157	2,605
Santa Barbara	15,621	504	502	707
Santa Maria	537,220	17,330	15,608	6,021
Summerland	990	32	32	31
Ventura Avenue	1,145,178	36,941	36,989	33,389
Ventura-Newhall	144,365	4,657	5,537	4,599
Watsonville	1,550	50	50	60
Group No. 3				
Brea-Olinda	188,531	6,082	6,269	8,013
Coyote—East	117,759	3,797	3,990	3,189
Coyote—West	260,951	8,418	8,095	7,436
Domingues	894,549	28,857	29,322	24,555
El Segundo	495,649	15,989	16,711	3,960
Huntington Beach	1,061,246	34,234	34,759	36,692
Inglewood	500,535	16,146	16,016	13,389
Lawndale	2,140	69	90	98
Long Beach	1,762,249	56,847	57,550	61,285
Los Angeles-Salt Lake	17,355	560	546	821
Montebello	251,466	8,112	8,531	9,723
Playa Del Rey	208,016	6,710	7,172	9,585
Potrero	9,113	294	397	287
Richfield	294,105	9,487	9,942	7,956
Rosecrans	184,700	5,958	6,362	2,518
Santa Fe Springs	1,208,879	38,996	40,583	44,558
Seal Beach	297,473	9,596	9,794	8,966
Torrance	246,174	7,941	8,013	7,623
Whittier	27,635	892	922	935
Wilmington	3,121,557	100,695	101,163	8,122
Total	22,441,293	723,913	735,991	594,445
February	20,607,735	735,991		
Decrease (*Increase)	1,833,558*	12,078		

STOCKS HELD IN PACIFIC COAST TERRITORY BY CALIFORNIA OIL COMPANIES

	Mar. 31, 1938	Feb. 28, 1938	March Changes	Dec. 31, 1937 Reclassified
1. Fuel Oil Residuum and Non-Gasoline-Bearing Crude	76,907,466	74,428,663	+2,478,803	68,529,388
2. Gas Oil and Diesel Oil	9,241,322	9,103,824	+ 137,498	8,648,990
3. Gasoline-Bearing Crude	31,556,951	31,104,054	+ 452,897	29,417,842
4. Unblended Nat. Gas	2,549,761	2,390,076	+ 159,685	2,001,204
5. Gasoline (not including distributing and service stations)	15,452,752	15,134,960	+ 317,792	13,520,678
6. Naphtha Distillates	1,666,410[1]	1,587,174[1]	+ 79,236	1,464,577[1]
7. All Other Stocks	4,994,964[2]	4,778,383[2]	+ 216,581	4,457,568[2]
TOTAL	142,369,626	138,527,134	+3,842,492	128,040,247
[1]Estimated amount of unfinished gasoline contained in item 6	1,474,686	1,389,001		1,248,291
[2]Coke included in item 7	22,105	22,142		22,435

	New Rigs Up	Active Drilling	Producers Completed	Daily Initial Output	Active Producing	ABANDONED WELLS Drillers	Producers
Group No. 1							
Belridge—North	..	7	5	5,589	61	....	1
Belridge—South	..	....	....	....	130	....	....
Canal	1	3	....	....	3	....	....
Canfield Ranch	1	....	....	....	1	....	....
Coalinga	2	4	....	....	838	1	....
Edison	..	1	....	....	87	....	....
Elk Hills	..	....	....	....	172	....	....
Fruitvale	1	2	1	110	164	1	....
Greeley	..	6	1	650	13	4	....
Kern River	2	3	....	....	1,354	1	....
Kettleman Middle Dome	..	....	....	....	3	....	....
Kettleman North Dome	..	18	....	....	192	....	....
Lost Hills	1	4	1	30	225	1	....
McKittrick	1	....	....	....	214	2	....
Midway-Sunset	3	7	3	528	2,533	3	1
Mountain View	..	....	....	....	194	1	....
Mount Poso	5	7	2	305	279	....	....
Rio Bravo	1	7	2	1,866	3	....	....
Round Mountain	1	3	2	553	176	2	....
Ten Section	1	3	2	5,790	15	....	....
Wheeler Ridge	..	1	....	....	26	....	....
Group No. 2							
Capitan	2	....	....	....	42	....	....
Elwood	..	....	....	....	71	....	....
Rincon	1	2	1	287	40	....	....
San Miguelito	..	....	....	....	16	....	....
Santa Barbara	..	....	....	....	35	....	1
Santa Maria	6	15	15	13,853	292	1	4
Summerland	..	1	....	....	18	....	....
Ventura Avenue	5	10	3	5,203	277	....	....
Ventura-Newhall	2	3	1	65	550	....	1
Watsonville	..	....	....	....	7	....	....
Group No. 3							
Brea-Olinda	..	1	....	....	354	....	1
Coyote—East	1	2	....	....	88	....	....
Coyote—West	1	1	....	....	45	....	....
Domingues	..	4	....	....	180	....	....
El Segundo	1	....	2	1,440	64	1	....
Huntington Beach	..	1	....	....	560	....	1
Inglewood	..	....	....	....	200	....	....
Lawndale	..	....	....	....	6	....	....
Long Beach	6	6	4	1,285	1,249	1	4
Los Angeles-Salt Lake	..	....	....	....	113	....	....
Montebello	1	7	....	....	216	....	....
Playa Del Rey	..	....	....	....	198	....	3
Potrero	1	....	....	....	11	....	....
Richfield	3	5	3	1,314	300	1	....
Rosecrans	1	2	1	1,071	89	....	....
Santa Fe Springs	..	....	1	59	664	....	2
Seal Beach	..	....	....	....	111	....	....
Torrance	3	6	2	445	514	....	....
Whittier	..	....	....	....	135	....	....
Wilmington	21	38	30	49,847	430	....	....
Miscellaneous Drilling	*6	46	....	....	....	6	....
Group No. 4—Gas Fields							
Buena Vista Lake	..	1	....	....	4	....	....
Buttonwillow	..	....	....	....	16	....	....
Chowchilla	..	....	....	....	....	....	....
Delano	..	....	....	....	1	....	....
Dudley Ridge	..	....	....	....	....	....	....
Goleta	..	....	....	....	....	....	....
McDonald Island	..	1	....	....	4	....	....
Rio Vista	1	2	....	....	13	....	....
Semi-Tropic	..	1	....	....	20	....	....
Tracy	..	....	....	....	5	....	....
March	82	231	82	90,290	13,630	26	19
February	121	242	70	78,461	13,605	17	17
Increase (*Decrease)	39*	11*	12	11,829	25	9	2

Business and Professional Directory

THE
HANCOCK OIL COMPANY
of
CALIFORNIA

PRODUCERS - REFINERS
MARKETERS

J. R. PEMBERTON
Oil Umpire
1110 Security Title Insurance Bldg.
Los Angeles, Calif.
TRinity 9705

MARTIN VAN COUVERING
PETROLEUM ENGINEER
405 South Hill Street
LOS ANGELES
CALIF.
MIchigan 8781

GERARD HENNY, Ph.D.
Consulting Geologist
417 S. Hill St. Los Angeles
VAndike 7053

GRAYDON OLIVER
PETROLEUM ENGINEER
215 West 7th Street
Los Angeles, Calif. VAndike 3696

LOUIS C. CHAPPUIS
Consulting Geologist
508 Wright & Callendar Bldg.
Los Angeles MUtual 4821

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Oil Men's Calendar

May

California Natural Gasoline Assn. meets the first Thursday of each month.

6-12—New Orleans, La. American Gas Association. Natural Gas Department.

10—Long Beach, Los Angeles Basin Chapter, A.P.I.

11-13—Tulsa. Natural Gasoline Association, Hotel Tulsa.

12-14—Tulsa. National Oil Scouts Association of America.

14-21—Tulsa. International Petroleum Exposition.

June

6—Houston, Tex. Oil Workers International Union.

20-24—St. Louis, Mo. American Society of Mechanical Engineers.

September

5-9—American Chemical Society, Milwaukee, Wis.

14-16—Santa Barbara, Calif., annual meeting Pacific Coast Gas Association, Biltmore Hotel.

14-16—National Petroleum Assn., 36th Annual Meeting, Hotel Traymore, Atlantic City, N. J.

21-23—National Industrial Advertisers Assn., Inc., 16th Annual Meeting, Cleveland, Ohio.

MAPS

Large map of Los Angeles Basin oil fields and map showing all California oil fields. Price $15.00 each on paper and $20 each on cloth. Individual state oil and gas maps of Mid-Continent and Rocky Mountain regions. Maps show geological cross sections at base. These maps indicate wells drilling, wells producing and abandoned, with depths.
All maps revised up to date of purchase.
JAMES C. BRANSFORD
1127 Story Bldg.
Los Angeles, Calif.
Phone: TUcker 7530

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